



DIV. INSECTS
U. S. NAT. MUS

U.S. INSECTS
U. S. NAT. MUS.

MEMOIRS
OF THE
BOSTON SOCIETY OF NATURAL HISTORY.

VOLUME II. PART IV. NUMBER I.

Raymond L. Shannon
June 1916.

PRODROME OF A MONOGRAPH OF THE TABANIDÆ OF THE
UNITED STATES.

PART I. THE GENERA PANGONIA, CHRYSOPS, SILVIUS,
HEMATOPOTA, DIABASIS.

By C. R. OSTEN SACKEN.

BOSTON :
PUBLISHED BY THE SOCIETY.
APRIL, 1875.

XIII. PRODROME OF A MONOGRAPH OF THE TABANIDÆ OF THE UNITED STATES. Part I.
The Genera Pangonia, Chrysops, Silvius, Hæmatopota, Diabasis. By C. R. OSTEN
SACKEN.

Read January 6, 1875.

THE purpose of the present paper is to pave the way for a future monograph of the *Tabanidæ* of the United States. In a family as difficult as the present, a preparatory paper of this kind does good service in encouraging collectors and disclosing the doubtful points which can be solved only by an increase of material.

A conscientious monograph requires, besides specific descriptions, a thorough investigation of the generic and family characters, based upon the knowledge of the generic forms of the whole world. My present purpose being merely the discrimination of the species, I refer, for the definition of the genera, to the existing works on the subject. I would especially recommend the chapter on *Tabanidæ* in Dr. Loew's large work: *Die Diptern-Fauna Süd-Africa's*, in which a critical review of the whole family and of all the adopted genera is given. A similar review will be found in Dr. Schiner's *Diptera* of the Novara expedition.

The types of all the descriptions given below are to be found in the Museum of Comparative Zoology, in Cambridge, Mass., unless otherwise mentioned.

The following tabular arrangement has no other claims than to embrace the genera and species contained in the present paper.

TABULAR ARRANGEMENT OF THE NORTH AMERICAN GENERA OF TABANIDÆ.

- | | | |
|----|--|---------------------------------------|
| 1. | { Hind tibiæ with spurs at the tip. Ocelli in most cases present. | 2. |
| | { Hind tibiæ without spurs; no ocelli | 4. |
| 2. | { Face and front (♀) without tubercles or callosities | Pangonia. |
| | { Front (♀) provided with a tubercle or callosity | 3. |
| 3. | { Second antennal joint almost as long, or as long, as the first; wings with a black or brown design | Chrysops. |
| | { Second antennal joint very much shorter than the first; wings without any spots | Silvius. |
| 4. | { Front (♀) much longer than broad; frontal tubercle (when present) not transverse | { Tabanus.
Diabasis. |
| | { Front (♀) as broad as it is long, or broader; frontal tubercle transverse (about four times broader than long) | Hæmatopota. |

PANGONIA.

The described species from the United States (with the exception of *P. fusiformis* Walk.) may be tabulated as follows:—

- | | | |
|----|--|---------------------------|
| 1. | { Proboscis longer than the whole body | macroglossa Westw. |
| | { Proboscis not much longer than the head. | 2. |

2.	{ First posterior cell closed	incisa Wied.
	{ First posterior cell open	3.
3.	{ Antennæ dark	4.
	{ Antennæ light reddish or yellow	5.
4.	{ Hind borders of abdominal segments with gray hairs	rasa Loew.
	{ Hind borders of abdominal segments with golden-yellow hairs.	tranquilla n. sp.
5.	{ Wings subhyaline, with a yellow stigma	pigra n. sp.
	{ Wings brownish, except the base and a space on the hind margin, which are hyaline .	chrysocoma n. sp.

Of these six species, I know only those described by me, and the one described by Mr. Loew. The seventh species, *P. fusiformis* Walker, Dipt. Saund., p. 19, I could not insert in the table, on account of the insufficiency of the description. The four species described below, as well as *P. incisa* Wied. are provided with ocelli; *P. macroglossa* Westw., has none.

According to a manuscript note of Dr. LeBaron on a specimen of *P. rasa* Lw. which I have from him, the eyes of this species are immaculate. This is the only statement in my possession concerning the coloration of the eyes in this genus.

1. *Pangonia rasa*.

Pangonia rasa Loew., Centur., viii, 7.

Antennæ blackish-brown, two basal joints reddish; hind margins of the abdominal segments beset with grayish hairs; wings sub-hyaline, stigma brown.

♂. Thorax blackish-brown above, and with brownish hairs; gray on the sides; abdomen brownish.

♀. Thorax blackish-gray above, with short, appressed, white hairs; gray on the sides; abdomen brownish or blackish.

Length, 10-12 mm.

Face and front gray, with a slight yellowish tinge; palpi reddish, beset with black hair; antennæ: two basal joints and extreme base of the third dark reddish, the former beset with black hair; the remainder of the third segment dark brown. Proboscis a little longer than the head. Thorax (♂) dull brownish-black, with a brownish gray-pollen, forming two indistinct longitudinal lines; a side view shows, in front of the scutellum, two spots covered with bluish-gray pollen; sides of the thorax and breast gray; the dorsum is clothed with a brownish, erect pubescence: its sides and the pleuræ with long grayish hairs. In the ♀ the thorax is more grayish, with a faint brownish middle line and two lateral stripes of the same color; the dorsum is clothed with short, appressed white hairs; the pleuræ with long, soft hairs of the same color. Scutellum brown in the middle, hind margin gray. Abdomen more or less dark brown; two basal joints often blackish in the middle, hind borders of the segments paler, and beset with whitish hairs. Legs reddish-brown. Wings subhyaline, stigma brownish; distal half of the marginal cell faintly tinged with brownish; posterior cells open.

Hab. Illinois (LeBaron); Wisconsin (Kennicott); Manlius, N. Y. (J. H. Comstock). Two male and three female specimens.

2. *Pangonia tranquilla* n. sp.

♂, ♀. Brownish-black, sides of abdomen and base of venter reddish, abdominal segments beset with golden-yellow hairs on the posterior borders; legs brown, antennæ black, wings tinged with brownish.

Body 12, wings $10\frac{1}{2}$ millim. long.

Head yellowish-gray, beset with yellowish-gray hairs; palpi (♂) brown beset with black hairs, palpi (♀) narrow, brownish-black, grayish-pollinose at the base, sometimes reddish at tip; proboscis somewhat longer than the head, black with well developed labella; antennæ black; basal joint slightly grayish-pollinose and beset with black hairs. Thorax brownish, with gray pollen and beset with yellowish hairs; in the ♂ the thoracic dorsum shows three brown longitudinal lines on grayish ground; scutellum brownish, posterior margin grayish-pollinose. Abdomen blackish-brown; three basal segments reddish-yellow on the sides and on a narrow margin posteriorly; the following segments have only a trace of yellowish-red on the sides; all the segments with a fringe of golden-yellow hairs on the posterior margin; venter; basal segments reddish-yellow, the following ones black. Legs black, knees somewhat paler. Wings with a brownish tinge, which is more saturate and somewhat yellowish in the region of the stigma and along the anterior margin; no stump of a vein on the fork of the third vein; posterior cells open.

Hab. Massachusetts (Mr. Sanborn); White Mts. (B. P. Mann); also in the Middle States (Entom. Soc. Phil.); Canada (Belanger). One male and two females.

3. *Pangonia pigra* n. sp.

♂, ♀. Brownish-yellow, beset with golden-yellow hairs; antennæ and legs reddish-yellow. Wings hyaline, stigma yellow.

Body 11–11½, wings $10\frac{1}{2}$ millim. long.

Female. Head yellowish-gray; palpi reddish-yellow, beset at the base with pale yellow hairs; antennæ reddish, basal joints yellowish-pollinose and beset with pale hairs; proboscis somewhat shorter than the head, comparatively stout, with large labella. Thorax fulvous, with short appressed yellow hairs above, altogether covering the blackish stripes on the disc; longer, paler hairs on the sides and below. Scutellum fulvous, more or less blackish in the middle. Abdomen brownish-yellow, with appressed golden-yellow hairs, especially apparent as a fringe on the posterior margins of the segments. Legs brownish-yellow. Wings nearly hyaline, slightly grayish; yellowish at base and along the costal margin, inside of the first longitudinal vein; stigma large, elongate, saturate yellow; no stump on the fork of the third vein; posterior cells open.

A male from the Museum of the Entomological Society in Philadelphia has the thoracic dorsum blackish, with two reddish lines separating the usual stripes; the scutellum is blackish in the middle; the brownish-red abdomen has, besides the appressed golden-yellow hairs, which are but little apparent, some short, erect blackish hairs, especially visible on the sides.

Hab. Bee Spring, Kentucky, in June (Sanborn); another specimen from the State of New York. Two females, one male.

4. *Pangonia chrysocoma* n. sp.

Antennæ reddish; proboscis very short; wings, brownish anteriorly, hyaline at the root and posteriorly.

♂. Thorax and abdomen dark brown, the latter with the hind margins of the segments yellowish and beset with golden-yellow hairs.

♀. Thorax and abdomen pale yellow, clothed with an appressed, shining, golden-yellow pubescence.

Length, ♂ 10 mm.; ♀ 14 mm.

Male. Antennæ reddish, two basal joints beset with long, black hair; face brownish, clothed with yellowish-brown pollen. Thorax blackish-brown, with a yellowish pubescence; pleuræ grayish-pollinose. Abdomen blackish-brown, with narrow yellow bands, clothed with a golden-yellow pubescence, along the incisures of the segments. Legs reddish-yellow, tips of tarsi brownish. Wings: root hyaline, with pallid veins; a brown cloud occupies the proximal and anterior part of the wings, filling the two basal, the marginal, the greater portion of the first submarginal, and the proximal half of the first posterior cells; also invading the proximal ends of the discal and the fifth posterior cells; anal angle and anal cell also tinged with brown in the middle; costal cell and stigma brownish-ferruginous; second submarginal cell grayish; the remainder of the wing, between the ends of the third and fifth veins, along the hind margin, including the larger portion of the discal cell, hyaline.

Female. Head pale yellow, opaque; front very broad, broader anteriorly than posteriorly; eyes comparatively small; a triangular space above the antennæ is destitute of pollen, and hence more shining; below the antennæ, down to the palpi, there is a convex, trapezoidal reddish-yellow, shining space, limited by deep grooves. Antennæ yellow, third joint reddish. Palpi yellow, with short, black hairs. Proboscis extending but little beyond the palpi, yellow, lips large. Cheeks clothed with a very soft, whitish pubescence. Thorax somewhat reddish on the disc, with a faint trace of a longitudinal dark line, otherwise uniformly yellowish, densely clothed with appressed pale yellow, shining hairs. The abdominal segments above show some traces of brownish at the base; otherwise the abdomen is uniformly yellowish, with a dense, appressed, pale golden-yellow, shining pubescence. Halteres and legs yellow. Wings: a pale brown cloud of a rather indefinite outline occupies the two basal, marginal and submarginal cells, somewhat encroaching upon the base of the first posterior, of the discal and slightly upon the fifth posterior cells; the root of the wing is hyaline; the costal cells, the base of the marginal cell and the whole posterior half of the wing are impure hyaline; a slight brownish cloud in the axillary corner of the wing. Stigma and its environs tinged with yellow. Base of the second submarginal cell rather acute; no stump. All posterior cells open.

Hab. Middle States; Trenton Falls, N. Y.; Delaware. (A male in the Museum of the Ent. Soc. Philad.; a female in Mus. Comp. Zool., Cambridge, Mass.)

Observation. The proboscis of this species is unusually short for a *Pangonia*; the basal division of the third joint is stout, without any vestige of an angular projection; the (♀) front is three times as broad as in the three preceding species; the head is flattened, etc.¹

¹It may be useful to reproduce here the rather inaccessible description of *P. macroglossa* Westw. (Lond. and Edinb. Philos. Magaz. 1835).

Pangonia macroglossa Westw.—Pallide fusco pubescens; facie alba, (ocellis 0), thorace vittis duabus longitudinalibus in medio, lateribus et macula utrinque basin versus

alarum albis, abdomine piceo, segmento primo fulvo marginato, 2^o et 3^o albo marginato, 3^o rufo marginato, reliquis fusco marginatis; alis basi et a costam late intumatis; pedibus testaceis.—Long. corp. lin. 8 $\frac{3}{4}$ long.; prob. lin. 15. Exp. alar, lin. 10. Hab. in Georgia.

CHRYSOPS.

The great difference in the coloring of the body, existing between the males and the females of Chrysops and the comparative rarity of the former in collections, compelled me to adopt the plan of basing this monographic essay principally on the female specimens. Thus the analytical table is drawn for females only; in the diagnoses and descriptions, the females are introduced first; short, comparative descriptions of the males are added, wherever they are known. Although it seems easy enough to refer the males to the proper females, by the comparison of the design on the wings, and especially on their distal portion, which is usually identical in both sexes, I would hesitate to place an absolute reliance on such identifications, until they were confirmed by actual observation, that is, by a capture of both sexes together in the same locality. Such captures I have been able to make in a very few cases only, and for this reason most of the females described below are accompanied by probable, but nevertheless hypothetical, males.

For further details on the genus Chrysops, I refer to Dr. Loew's paper on the European species (Verh. Zool. Bot. Gesellsch. 1858, p. 613). I would only add a single remark concerning a character not mentioned by him, namely, the coloring of the eyes in living specimens. All the American species of Chrysops which I had the opportunity to observe alive, have the eyes colored very nearly in the same manner (fig. 1); that is, the ground-color being green, there is along the occipital margin a dark purple border with an indentation in the middle; on the opposite or frontal margin, there are three purple spots; and between the two, in the middle of the eye, there is a fourth spot, usually arrow-shaped, the shaft of which reaches upwards and ends in the occipital border (*C. excrucians*). All the species observed by me show only modifications of this design. Sometimes the occipital border, instead of being notched, is interrupted in the middle; or the arrow-head is connected on one side with the middle one of the three spots near the frontal margin (*C. plangens*); or the shaft is interrupted above (*C. niger*), or altogether wanting; in the latter case, the arrow-shaped spot is sometimes replaced by a more or less rounded one, and when this round spot is connected with the lateral spot near it (fig. 2, *C. fugax*) the pattern appears considerably modified, although it belongs to the same original type. Slight variations occur in the same species, and my observations have not been sufficiently numerous to enable me to characterize the eyes of each species separately. *C. astutus*, *montanus*, *hilaris*, *excrucians*, *delicatulus*, *niger*, *univittatus*, *plangens* and *fugax* have their eyes colored on the above described pattern with the indicated modifications. The male specimens show the same design, only modified by the lengthening of its upper half and the shortening of the lower one, the former having the larger and the latter the smaller facets. The only exceptional pattern, which I have hitherto observed, is that of the eyes of *C. flavidus* Wied, a species very different in its general appearance and coloring from the typical Chrysops. (See fig. 3.) In this pattern the central spot (the arrow-head,) which is the most persistent feature in the eyes of the first pattern, has disappeared.



Fig. 1. Fig. 2. Fig. 3.

A few words only will be necessary in explanation of the terms used by me in the following descriptions. I call *apical spot* every infuscation of the portion of the wing

beyond the usual crossband, whether this infuscation is connected with the crossband or separated from it. The hyaline interval between the crossband and the apical spot, I have usually called the *hyaline triangle*.

In identifying species of Chrysops, the principal attention should be paid to the design of the wings. It is characteristic of the species and, at the same time, remarkably constant within the same species. It also helps to refer the male specimens to their females, however different in coloring the sexes may be. The wings of the male are usually somewhat darker on their proximal half; the infuscation of the two basal cells reaches farther towards the distal end of these cells, the anal cell and anal angle often have a brownish tinge, which may not exist in the female. But in the distal half of the wing, especially in the shape of the apical spot and of the hyaline triangle between it and the crossband, the resemblance between the sexes is, in most cases, much greater. The coloring of the antennae and of the legs is very variable within the same species and in the same sex, and not to be relied upon. The relative extent of black and reddish on the abdomen is also very variable in the same species; often the whole appearance of a specimen is changed by an extensive prevalence of the one or the other color. The coloring of the wings is the only safe guide through all these difficulties.

The insufficiency of most of the descriptions by Walker and Macquart has compelled me, in many cases, to quote their descriptions as doubtful synonyms of my supposed new species. As I give detailed and I hope sufficiently clear, descriptions of all the species, I trust that in most cases there will be but little doubt as to the species I mean to describe. The other question, that of the names to be given to these species, is comparatively of a secondary importance, and can be settled only through the comparison of the original types of the earlier descriptions in London and Paris.

I describe in this paper twenty-three species of Chrysops distributed over the area contained between the District of Columbia, Wisconsin and Canada (besides *C. atropos*, from Florida); no doubt many more species will be discovered. The whole of Europe north of the Alps possesses only twelve species; the southern peninsulas have four species more; total for Europe sixteen species. Among the twenty-four North American species here described *seca* have no apical spot, that is the whole apical portion of the wing is hyaline. Of the sixteen European species not a single one belongs to this category. Four European species have a hyaline or subhyaline spot in the middle of the crossband; no such species have been discovered yet in the Atlantic basin of North America; but I have seen one or two from California. Such are the results of a comparison of both faunas, based on the descriptions of the European species. A comparison of specimens would probably disclose still other curious analogies or differences; unfortunately I have specimens of only two European species before me.

ANALYTICAL TABLE OF THE SPECIES (CONSTRUCTED FOR FEMALE SPECIMENS ONLY).

- | | | | |
|----|---|--|-----------------------------|
| 1. | { | The apex of the wing, beyond the crossband, is hyaline | 2. |
| | { | The apex of the wing, beyond the crossband, is more or less infuscated | 8. |
| 2. | { | The whole wing, except the apex, is black, fading into dark-gray posteriorly | 1. atropos n. sp. 27 |
| | { | The whole wing, besides the apex, is not black | 3. |

3. { Both basal cells are infuscated on their proximal half. 4.
 { Second basal cell hyaline; face ferruginous in the middle **7. niger** Macq. 377
4. { Abdomen marked with more or less yellow on the sides 5.
 { Abdomen altogether black 6.
5. { Abdominal segments with narrow gray borders posteriorly; the yellow spots on the sides of the first
 two abdominal segments small **6. sordidus** n. sp. 378
 { Abdominal segments without any gray hind borders; the yellow spots on the sides of the abdomen
 usually large **2. excitans** Walk. 377
6. { Thorax with a conspicuous tuft of yellowish-ferruginous hairs on each side, in front of the
 wings **5. celer** n. sp. 376
 { Thorax with pale yellowish hairs on the sides 7.
7. { Fifth posterior cell filled out with brown at the proximal end; thorax with two rather distinct whitish
 lines anteriorly **3. mitis** n. sp. 374
 { Fifth posterior cell with a small hyaline spot at the proximal end; no distinct white lines on the
 thorax **4. fugax** n. sp. 375
8. { Whole body brownish-yellow; abdomen with a pale-brownish design **5. flavidus** Wied. 375
 { Body more or less black (or at least with black longitudinal stripes on the abdomen) 9.
9. { Both basal cells hyaline¹. 10.
 { First basal cell altogether, or to a considerable extent, infuscated 17.
10. { The apical spot consists of a narrow brown border along the costa, between the crossband and the
 apex; (distal half of the first submarginal cell, except at its extreme end, hyaline) 11.
 { The apical spot is broad, and fills out a considerable portion of the distal half of the first submar-
 ginal cell 13.
11. { Crossband in the usual shape, not attenuated posteriorly 12.
 { Crossband attenuated posteriorly, the brown occupying but a small portion of the discal and fourth
 posterior cells **10. delicatulus** n. sp. 378
12. { A black triangle encroaches upon the yellow on each side of the Λ -shaped black spot on the second
 abdominal segment. **8. æstivans** v. d. Walp. 379
 { No black triangles on the sides of the Λ -shaped black spot on the second segment. **9. callidus** n. sp. 379
13. { The hyaline triangle, between the apical spot and the crossband, stops short at the second longitudinal
 vein. 14.
 { The hyaline triangle, etc., is prolonged beyond the second longitudinal vein, towards the costa 15.
14. { Second and third abdominal segments black, with yellow hind margins, expanded into triangles in the
 middle; frontal callosity reddish **11. pudicus** n. sp. 378
 { Second and third abdominal segments yellow, with four broad longitudinal black lines, which are often
 broader than the intervening yellow spaces; frontal callosity black **12. montanus** n. sp. 378
15. { Abdomen dark brown, or black above, with a yellow longitudinal stripe, attenuated posteriorly, and
 two shorter and narrower stripes on each side **23. obsoletus** Wied. 379
 { Abdomen yellow above, with two small, converging black spots on the second segment; segments
 three and four black and yellow 16.
16. { The crossband reaches the posterior margin **22. fallax** n. sp. 379
 { The crossband does not quite reach the posterior margin, the fourth posterior cell not being quite filled
 out with brown **21. hilaris** n. sp. 379

¹The species referred to here have, in some instances, an inconsiderable infuscation at the proximal end of the first basal cell, while the species referred to No. 17 have this cell infuscated far beyond the middle. Between these alternatives, a doubt may arise in the following cases only.

C. montanus, which has the largest infuscation of the first basal cell, among all the species referred to No. 19.

C. f. hipidus, which has the smallest infuscation among the species referred to No. 17.

17. { Body altogether gray or blackish **24. plangens** Wied.¹
 { Body more or less marked with yellow. 18.
18. { Face black, with the usual stripes of fulvous pollen **14. frigidus** n. sp. 594
 { Face ferruginous in the middle 19.
19. { Apical spot large, reaching beyond the second submarginal cell, and invading the first posterior 20.
 { The apical spot does not reach beyond the second submarginal cell. 22.
20. { The hyaline space, between the crossband and the apical spot, is confined to a small triangle in the
 second and third posterior cells **17. mœchus**¹ n. sp. 591
 { The hyaline space, etc., reaches across the first posterior cell 21.
21. { Abdomen with a broad, yellow, longitudinal stripe in the middle, enclosed between two blackish
 stripes **16. univittatus** Macq. 593
 { Abdomen brown, with three brownish-yellow, often indistinct longitudinal stripes **18. morosus** n. sp. 599
22. { Abdomen yellow, with four black stripes 23.
 { Abdomen black, yellow on the sides, and with yellow triangles on the segments **13. indus** n. sp.²
23. { Frontal tubercle and scutellum reddish. **19. vittatus** Wied. 590
 { Frontal tubercle black; scutellum at the base, more or less blackish. **20. striatus** n. sp. 591

DESCRIPTION OF THE SPECIES.

A. The apical portion of the wing, beyond the crossband, is hyaline, without any distinct brown spot or brown border.

1. *Chrysops atropis* n. sp.

?*Chrysops divisis* Walker, List, etc., I, p. 204.

♀. Altogether black, wings tinged with black, except the apex, which is hyaline.

Length, 9-10 mm.

Female. Altogether black; a large, shining black, obtriangular surface occupies almost the whole face, showing each side a mammiform protuberance; streaks of fulvous pollen between this triangle and the black cheeks; pollen of the same color forms a narrow border along the facial orbit, round the root of the antennæ and on the sides of the front; the black, shining, frontal callosity is separated from the vertex by an opaque, brownish-pollinose crossband. Palpi black, brownish on the inside. Antennæ black, comparatively long, the first and second joints being longer than usual; the first somewhat incrassate. Thorax clothed with a very thin chocolate-brown pollen, hardly concealing the shining black color beneath; it is more dense anteriorly, where it forms two indistinct lines, abbreviated posteriorly, and more visible from a side view; (this thoracic pollen is very easily rubbed off). Pleuræ brownish. Abdomen with scattered whitish hairs toward the tip. First joint of middle and hind tarsi yellowish, except the tip, which is black; root of second joint likewise pale. Apical third of the wings hyaline; the remainder black, which color is most saturate along the costa; anal cell and the whole anal angle, grayish. The veins in the hyaline, apical portion of the wing are yellowish, especially the costal vein.

Hab. Florida (Wekiva River, in March. Prof. J. Wyman; Indian River, E. Palmer). Eighteen female specimens.

¹ This is the hypothetical female of *C. mœchus* ♂, described below.

The description of *C. divinus* Walker, seems to agree with this species, except the important statement "chest and abdomen clothed with dark tawny hairs," of which there is no trace in *C. atropos*.

2. *Chrysops excitans*.

Chrysops excitans Walker, Dipt. Saunders, p. 72.

♀. Apex of the wings hyaline; proximal half of the two basal cells infuscated; two or three basal segments of the abdomen yellowish on the sides; a distinct gray or yellowish-gray triangle on the second segment.

Length, 10-12 mm.

♂. Body altogether black. Coloring of the wings darker than in ♀, with a fenestrate hyaline spot in the middle. Length, 10-11 mm.

Female. The black, shining facial callosities prolonged in front and converging above the mouth; between them, a short pointed stripe of fulvous pollen; similar stripes separate the callosities from the black, shining cheeks; frontal callosity large, black, shining, separated from the black spot on the vertex by a fulvous crossband attenuated in the middle; the orbits and the root of the antennæ show narrow margins of the same fulvous pollen. Antennæ: first joint reddish-black at tip; second joint darker, almost black, although showing traces of red, especially on the under side; third joint black. Thorax blackish, clothed with fulvous hair, especially dense on the pleuræ; on the dorsum the beginning of a broad, but faint gray stripe is visible anteriorly; it is more or less distinctly margined with lines of yellowish pollen on each side, and is divided longitudinally by a faint, black line. Abdomen black, the sides of two, sometimes three, basal segments, yellowish tawny; the posterior margins of the second, third and fourth segments show, on the black color in the middle, triangles beset with golden hair; that on the second segment is especially large and distinct; (in rubbed specimens this triangle is grayish or yellowish, the latter in such specimens where the yellow on both sides is continued along the posterior margin). The third and following abdominal segments are black, clothed with golden-yellow hair on their surface, as well as on their posterior margin. Venter yellowish-tawny at the base, black towards the tip, the black more or less encroaching upon the yellow along the central line in the shape of spots of different sizes in different specimens. Legs black, with a vestige of brownish at the basis of the tibiæ and of the four posterior tarsi. Wings with a hyaline apex; the two basal cells infuscated up to the middle; the crossband does not reach the posterior margin and does not fill out the fourth posterior cell; the inner end of the fifth posterior cell is infuscated, although less dark than the crossband; anal cell and anal angle have a slight brownish tinge; the fifth vein, up to the crossvein, is brown in older specimens. A more or less distinct whitish halo along the distal margin of the crossband, sometimes hardly apparent.

The coloring of the abdomen of the female is very variable in the extent of the yellow; in some specimens the sides of the third and even of the fourth segments are of that color; in one specimen (British Possessions, Scudler) the yellow is the prevailing color on the abdomen, reaching the fifth segment, and leaving only a square black spot in the middle of the first, fourth and fifth segments, and a bilobed spot on the second and third. The coloring of the venter shows more or less yellow, in proportion to the upper surface; in

the latter specimen, the venter is almost entirely yellow, except at the extreme tip; in very dark specimens it is almost entirely black. The pattern of the wings is remarkably uniform in all specimens.

Male. Body altogether black; abdomen, towards the tip with grayish golden hairs, which, on the second, third, and fourth segments, form faint triangles; (in rubbed off specimens a very faint gray triangle is visible on the second segment). Venter black, sometimes brownish on the sides of the posterior margins of the segments, clothed with golden hairs, especially on the margins. The thorax is clothed with black hairs; in some specimens, however, rather numerous yellowish-gray hairs are mixed with them, in which case the thorax somewhat resembles that of the female; a trace of gray pollen is visible anteriorly. The pattern of the wings is like that of the female, only the brown of the two basal cells is more intense and reaches beyond the middle of the cells, reaching the brown in the proximal end of the fifth posterior cell, thus leaving a well-marked hyaline fenestrate spot in the shape of a parallelogram in the middle of the wing. The brownish tinge in the anal cell and in the anal angle is also more saturate than in the female. A slight blackish shadow (indistinct in some specimens), is visible in the hyaline portion of the marginal cell, near the costa (a mere vestige of it is often perceptible in female specimens).

Hab. A common and wide-spread species. Catskill, N. Y., in July; Waterville, N. H., July (Scudder); different parts of British America (the same); Lake Superior (A. Agassiz); Yukon River and MacKenzie River (Kennicott); Anticosti (Verrill), etc. Twenty-five female and five male specimens.

Observation. The description was principally drawn from eight well preserved and fresh specimens, male and female, which I caught in the summer of 1874 near the Mountain House, Catskill, N. Y. The specimens from Anticosti are very dark, and the facial pollen is grayish, rather than fulvous. I have but little doubt concerning the identity of the above described species with Mr. Walker's *C. excitans*. Some error must have been committed by him in the description of the antennæ, which is not clear. He describes only the female.

3. *Chrysops mitis* n. sp.

?*Chrysops provocans* Walker, Dipt. Summl., p. 73.

♀. Apex of the wings hyaline; proximal half of the two basal cells infuscated; anal cell and anal angle more or less tinged with brownish; two grayish, interrupted lines on the thorax; abdomen altogether black, with faint triangles of grayish hair.

Length, 11-12 mm.

Not unlike the preceding species, from which the female is easily distinguished by an altogether black abdomen, with a grayish and not golden pubescence.

Female. Head as in *C. excitans*, only the pollen on face and front is yellowish-gray, instead of fulvous; (in one of my specimens, however, it is fulvous). Antennæ black, first joint reddish, black at tip; second, blackish-red on the underside. Thoracic dorsum with two gray longitudinal lines, reaching to about the middle; interval between them brownish, grayish-pollinose anteriorly, where the beginning of a blackish line is visible; pleuræ with dense yellowish-gray hairs in the upper part; some black hairs between the root of the wings and the humeri. Abdomen black, with a thinly scattered grayish pubescence, more

dense on the sides and towards the apex; on the second and third segments this pubescence forms faint triangles. Legs black, root of the four posterior tarsi brownish. Pattern of the wings as in *C. excitans*, except that the brown coloring is somewhat less dark, and that the brown in the two basal cells reaches a little farther, so that the hyaline space between this brown and that of the crossband is a little narrower, especially in the second cell. An indistinct whitish halo along the distal margin of the crossband.

Hab. British Possessions in N. America from Canada (W. Couper), to MacKenzie and Yukon Rivers (R. Kennicott); Lake Superior. Nine females.

This species is not unlike *C. excitans*, but is easily distinguished by the altogether black coloring of the abdomen, the two gray stripes on the thorax, which are much more distinct than the corresponding yellowish lines in that species, the above indicated slight difference in the coloring of the wings, etc. The brown of the picture, in most specimens, seems to be a little less dark than in *C. excitans*. The resemblance of *C. mitis* to *C. celer* will be discussed under the head of the latter species.

The identity of Mr. Walker's *C. provocans* with the present species seems probable. The statement that the facial callosities are larger than those of *C. excitans* agrees with this species better than with *C. celer*; the "tuft of pale yellow hairs . . . at the base of the wings", describes the pubescence of *C. mitis*, rather than the ferruginous pubescence of *C. celer*; but the statement that the crossband approaches nearer the hind border than that of *C. excitans*, renders the identification doubtful.

Macquart's description of *C. ater* agrees with the present species, except in size. As he compares *C. ater* to *C. niger* and at the same time makes it *half a line smaller*, the identification with *C. mitis* becomes impossible.

4. *Chrysops fugax* n. sp.

? *Chrysops carbonarius* Walker, List, etc., I, p. 203 (*ex parte*).

? *Chrysops ater* Macquart, Dipt. Exot. 4^e Suppl., p. 40.

♀. Like *C. mitis*, but smaller; whitish lines of the thorax imperceptible; gray triangles on abdomen almost imperceptible; a small hyaline spot at the proximal end of the fifth posterior cell.

Length, 8-9 mm.

I should hesitate to separate this from the preceding species, if it were not for the constancy of the characters just given. I have fourteen female specimens before me; from Norway, Me. (S. I. Smith), Gorham, N. H. (Austin), Canada (W. Couper), divide between Idaho and Montana (C. Thomas), Yukon River (Kennicott). All agree in having the fifth posterior cell hyaline at the proximal end, and not filled out with a brownish tinge; this hyaline spot coalesces with the hyaline space in the second basal cell. All such specimens are considerably smaller than the average-sized specimens of *C. mitis* and the best preserved among them show but a vestige of the whitish lines on the anterior part of the thorax, which are comparatively distinct in the other species. The dorsal triangles on the abdomen also, are hardly perceptible or not visible at all. In size and general appearance this species is not unlike *C. niger*, and I suspect that Mr. Walker's *C. carbonarius* is a mixture of the present species with *C. niger* Macq. His Var. β would, in this case, especially refer to *C. niger*. All the statements, which do not agree with *C. fugax* (as that the crossband "ex-

tends to the hind border," the description of the four hind tarsi, etc.) apply much better to *C. niger*. It must be borne in mind at the same time that what Mr. Walker had as *C. niger* is not Macquart's species at all, but my *C. sordidus*.

Macquart's *C. ater*, if we follow the letter of his description, may be the present species; nevertheless his statements are too vague for a positive identification.

5. *Chrysops celer* n. sp.

♀. Apex of the wings hyaline; proximal half of the two basal cells infuscated; body black; a conspicuous tuft of yellowish-ferruginous hairs on each side of the thorax.

Length, 11-12 mm.

Female. Facial and frontal callosities as in *C. excitans*, only somewhat smaller; the line of fulvous pollen separating the facial callosities is broad and short; on the front the pollen is more grayish. Antennæ ferruginous, except the latter portion of the third joint, which is black. Thorax with a very faint grayish median stripe enclosed between two gray lines, interrupted before the middle of the dorsum; the latter is clothed with short, grayish-white hairs. On each side of the thorax, between the root of the wings and the head, there is a conspicuous tuft of yellowish-ferruginous hairs, characteristic of the species. Abdomen uniformly black, clothed with a short, appressed grayish-white pubescence, which in well preserved specimens forms faint triangles in the middle of the second and third segments. Legs black, the four posterior tarsi with the first joint paler, except at tip; the following joints sometimes show a trace of the same pale color at the root. Wings: apex hyaline; the crossband does not quite reach the posterior margin, but extends, although in a paler shade, into the fifth posterior cell; two basal cells filled out with brown up to the middle, or a little beyond; anal angle and a portion of the anal cell tinged with gray; the whitish halo along the distal margin of the crossband is distinct.

Hab. Not rare in the Middle States; occurs also in Massachusetts. Eight females.

In many respects *C. celer* is very like *C. mitis*, but is easily distinguished by the tufts of ferruginous hairs on the thorax. The facial callosities of *C. mitis* are larger, the picture of the wings usually not quite as dark, etc.

6. *Chrysops sordidus* n. sp.

Chrysops niger Walker (nec Macquart), List, etc., I, p. 202.

♀. Apex of the wings subhyaline; second basal cell nearly hyaline, being infuscated at the proximal end only; an incipient apical spot in the shape of a faint cloud along the costa; abdominal segments on the posterior margin with narrow gray borders, and with small gray triangles in the middle; first and second segments with small yellow spots on the sides.

Length, 9-10 mm.

Female. Frontal and facial callosities, and the yellowish-gray or grayish-yellow pollen around them the same as usual in this group. Antennæ black, first joint reddish, except the tip (in some specimens the red is hardly perceptible). Thorax with a broad, but faint, grayish stripe, reaching beyond the middle and divided longitudinally by a faint blackish line; the lines which enclose it on the sides are blackish (and not gray or yellowish, as in *C. mitis*, *excitans*, etc.). Thoracic dorsum clothed with yellowish-gray hairs; tufts of longer

and denser yellow, sometimes almost fulvous hairs near the root of the wings and on the upper part of the pleura. Abdomen black; first and second segments more or less yellowish on the sides; all the segments, except the first, with a narrow gray border posteriorly, which expands into a distinct triangle on the first two segments, and a less distinct one on the third. In well preserved specimens these gray margins and triangles are clothed with a golden-yellow pubescence. On the venter the segments are covered with gray pollen posteriorly, and clothed with yellowish hairs. Legs black, the brownish color at the root of the four posterior tarsi hardly perceptible. Wings: general coloring of the hyaline portion dingy grayish; the brown portions but moderately dark; costal cells brown, first basal cell infuscated on its proximal half; second basal cell almost hyaline, except its extreme proximal end; fifth longitudinal vein more or less clouded with brownish, which, in some specimens, forms a distinct border inside of the second basal cell; the crossband does not reach the posterior margin, and fills obliquely the proximal half of the fourth posterior cell; a pale brown cloud fills the proximal end of the fifth posterior cell. The space along the costa between the crossband and the tip of the wing is faintly tinged with brown. The halo along the distal margin of the crossband is indistinct, although the apical portion of the wing is rather grayish.

Hab. White Mountains, N. H. Nine female specimens. The yellow color on the sides of the abdomen has more or less extent in different specimens; sometimes it is confined to the anterior corners of the second segment and is hardly perceptible on the first; such specimens have the first antennal joints almost black. On the average, the yellow on the abdomen has much less extent than in *C. excrucians*, and only extreme cases in both species show any approach to each other. *C. sordidus* is easily distinguished from all the preceding species by the gray posterior margins of the abdominal segments. Although the hairs upon them can be rubbed off, the gray margins and triangles remain, which is not the case in the other species of this group. (Only the triangle on the second segment in *C. excrucians*, and perhaps in *C. nitis*, shows the same permanence.)

Mr. Walker's description of *Chrysops niger* is based on specimens of the present species, as the description of the abdomen undoubtedly proves.

7. *Chrysops niger*.

Chrysops niger Macquart, Dipt. Exot., I, 1, 161, 10.

? *Chrysops carbonarius* Walker, List, etc., I, p. 203, Variet. β .

♀. Apex of the wings hyaline; second basal cell altogether hyaline; face ferruginous in the middle.

Length, $6\frac{1}{2}$ –8 mm.

Female. The black, shining facial callosities are separated by a large, shining, yellowish-ferruginous spot extending from the antennæ down to the mouth; the black, shining cheeks are separated from the callosities above them by the usual stripe of fulvous pollen; the pollen on the front is grayish-yellow. Antennæ: first joint reddish, often blackish at tip; second, blackish, mixed with reddish; third, black, reddish at base. Thorax with a broad greenish-gray pollinose stripe in the middle, divided longitudinally by a blackish line; its sides are more distinctly gray, assuming the appearance of two gray lines; on each side of

the dorsum, a grayish stripe, followed by a black one, between the root of the wings and the humeri; on the pleuræ a gray stripe, beset with long, yellowish hairs, is followed by a black one, and then by a second gray stripe extending posteriorly over the base of the abdomen. Abdomen black, with short, appressed grayish hairs. Legs black, first two joints of the four posterior tarsi livid, black at tip; sometimes the middle and hind tibiæ have a reddish tinge at the root. Wings: second basal cell and fifth posterior cell hyaline, so that the crossband is bounded posteriorly by the intercalary vein; there is a hyaline spot just before the distal end of the first basal cell (a vestige of the larger spot existing here in the other species of the group); the crossband almost touches the posterior margin, the extent of the intervening space not quite constant in different specimens; apex hyaline.

Hab. Middle and Northern States and British Possessions; not rare. In some specimens there is a paler streak in the fourth posterior cell, by the side of the intercalary vein; in others, a faint brownish tinge appears in the fifth posterior cell; or also on the margin at the tip of the fifth and sixth veins; sometimes there is a pale brown, very small cloud at the base of the fork of the third longitudinal vein.

I have a specimen from Illinois in which the first basal cell is almost entirely hyaline, showing only a trace of a brownish tinge on its proximal half. The specimen is a fully matured one, and otherwise normally colored. Until further evidence, I incline to think that it represents only an accidental aberration.

C. niger in several respects forms the passage to the next group. Its ferruginous face and the distinct longitudinal black stripes on the pleuræ foreshadow the coloring of that group.

The mention of "face fauve" by Macquart, and the description of the wings, seems to render the identification of this species certain, although the measurement given, five lines (about 11 mm.), is too large for this species.

Mr. Walker's description of *C. niger* (List, etc., I, p. 202) is principally based on specimens of *C. sordidus*. His *C. carbonarius*, var. β (evidently a different species from his type) seems to belong to the present species.

B. The apical portion of the wing, beyond the crossband, is more or less tinged with brown, either in the shape of a distinct brown border along the costa, or of a separate apical spot.

8. *Chrysops æstuans*.

Chrysops æstuans v. der Walp, Tijdschr. v. Ent., 2 Ser. II, p. 135; Tab. III, f. 8, 9.

? *Chrysops mocrens* Walker, List, etc., I, p. 201.

♀. Apical spot confined to a faint and narrow infuscation along the costa; both basal cells hyaline; halo along the crossband very distinct; the ends of the Λ -shaped black spot on the second abdominal segment expand into small black triangles on the posterior margin.

Length, 10 mm.

Female. Face, including the facial callosities, and cheeks yellowish-ferruginous, shining; facial orbits and the usual stripe between face and cheeks, powdered with yellowish-gray pollen; front covered with the same pollen, except the black frontal callosity and a blackish space on the vertex. Two basal joints of the antennæ ferruginous, clothed with black hair; third joint blackish, ferruginous at base. Palpi variable in color, reddish or brownish, red-

dish at base. Thorax black; a broad, glaucous intermediate stripe is divided in two by a black longitudinal line; on each side a glaucous-grayish stripe runs above the root of the wings, from the scutellum to the humerus; a blackish stripe separates it from the glaucous-grayish pleuræ; the latter glaucous-grayish, with a black stripe. Scutellum blackish. Abdomen black; first two segments pale grayish-yellow (livid) on the sides, black in the middle; the black on the second segment has somewhat the shape of a Δ , the middle triangle of this figure being of the same color as the sides of the abdomen; both ends of this figure expand laterally in the shape of small black triangles, resting upon the hind margin of the segment; the following segments are black, with a narrow gray posterior border, expanding into a triangle, with two adjacent gray marks; these triangles and marks are especially visible on segments 3-5. Wings: root, costal cells and cross-band brown; beyond the cross-band a narrow pale brownish cloud along the costa nearly reaches the tip of the wing; the crossband does not reach the posterior margin, the distal end of the fourth posterior cell being colorless, the last section of the fifth vein enveloped in a brownish cloud, connected with the crossband across the proximal end of the fifth posterior cell; the apex of the wing is grayish, with a very distinct whitish halo between it and the crossband; similarly, a brownish shadow in the anal angle of the wing renders more apparent the whitish-hyaline tinge of the two basal and of the proximal end of the anal cell. Legs variable in coloring; either red, tips of front and hind tibiae, front tarsi, and last four joints of the four posterior tarsi, blackish; or black, bases of middle tibiae and of the four posterior tarsi, reddish; with all the intermediate stages.

Hab. Red River of the North (Kennicott); Illinois (LeBaron); Wisconsin (v. d. Wulp); Dacota (Dr. Cones).

The extent of the yellow color on the abdomen is variable in this species. I have a specimen before me (Red River of the North) where the small black triangles on the second segment have their apex prolonged so as to meet the black on the corresponding side of the first segment. In another specimen (Illinois) with very dark legs, the yellow on the sides of the abdomen is replaced by a glaucous-gray, the black design of the first two segments being the normal one.

Mr. van der Wulp's description and figure are excellent, and refer to the variety with the darker feet. Mr. Walker's description is very incomplete, and is rendered still more doubtful by the locality (Nova Scotia); all the specimens of *C. astutus* hitherto received come from the Northwest.

9. *Chrysops callidus* n. sp.

♀. Apical spot in the shape of a narrow linear brown border along the costa; both basal cells hyaline; discal cell filled out with brown; no small black triangle on each side of the Δ -shaped black spot on the second abdominal segment.

♂. Wings as in the ♀, but both basal cells infuscated, with a common hyaline spot at the distal end.

Length, 8-9 mm.

Female. Head, antennæ and picture of the thorax as in *C. astutus*; the lateral stripes on the thorax and the pleuræ are more yellowish than glaucous; palpi more reddish. Abdomen black; first two segments pale yellow on the sides, black in the middle; the black

on the second segment has the shape of a Δ , the triangle encompassed by this figure being of the same color as the sides of the abdomen; the ends of this figure are sometimes (not always) prolonged laterally, along the hind margin, without expanding into small black triangles; segments 3 and 4 are black or brown, with yellow hind margins, expanding into triangles in the middle; on the black, a yellow spot is often perceptible on each side; in some specimens the whole of the segments 3 and 4 are yellow, except a double obtriangular spot in the middle, and a small dot, each side, near the anterior margin; segments 5-7 black or brown, with yellow hind margins. Venter yellow at base, blackish at tip; segments 3 and 4 often with blackish spots in the middle. Legs variable in coloring; either the prevailing color is yellowish-red, with the tips of front femora, front tibiae, the whole hind femora and all the tarsi, except the base, black; or the prevailing color is black, with the middle tibiae, the bases of front and hind tibiae, and base of the tarsi, reddish. The description of the wings of *C. astutus* applies to this species, with the following differences; the narrow brown border along the costa, between the crossband and the apex, is of the same shade of brown as the crossband and of the same breadth as the costal border between the crossband and the root of the wing; it reaches a little beyond the anterior branch of the fork of the third vein; the gray shade of the apical portion of the wing is much fainter, and hence the white halo along the crossband less distinct; the fourth posterior cell is almost filled out with brown, so that the end of the crossband is much nearer the posterior margin of the wing.

Hab. New Jersey; Delaware; Connecticut; Detroit, Mich. (H. G. Hubbard); Illinois (LeBaron). Eleven female specimens. The smaller size, the dark, well defined brown border between crossband and apex, the absence of the black triangles encroaching upon the yellow of the second segment, the yellow and not gray, hind border of the abdominal segments, easily distinguish the female of this species from the preceding.

Male. Two male specimens (Pennsylvania and New York) which I possess, belong, I have no doubt, to this species. The picture of the wings, especially the brown border between the crossband and the apex, is like that of *C. callidus*, only the two basal cells are filled out with brown up to their distal third, which is hyaline. The brown of the basal cells coalesces with the brown cloud, enveloping the last section of the fifth longitudinal vein. The facial callosities are brownish, the middle of the face reddish. Antennæ black. The coloring of the thorax is darker, the stripes less conspicuous. The sides of the abdomen are reddish-yellow, which color, in one of the specimens, extends to the third segment; the yellow triangles on the hind margins of the segments seem a little smaller, but the characteristic yellow hind margins are very distinct, and somewhat broader than in the female. The yellow dots on the back of the third segment are very plain in one of the specimens; in the other, yellow marks are visible on the fourth segment.

10. *Chrysops delicatulus* n. sp.

♀. Apical spot in the shape of a narrow linear brown border along the costa, attenuated at the distal end of the stigma; both basal cells hyaline; discal cell almost hyaline; the Δ -shaped black spot on the second segment broad in its outline; facial callosities and cheeks black.

Length, 6.5-7.5 mm.

Female. Facial callosities and cheeks black, the upper part of the former somewhat brownish; middle portion of the face dark ferruginous; the usual pollen on the face and around the black frontal callosity, gray. Antennæ black, first joint pale reddish. Thorax with a broad glaucous middle stripe, divided longitudinally by a black line; grayish glaucous lateral stripes; pleuræ likewise grayish-glaucous, with the usual blackish stripes. The first two abdominal segments are pale yellow on the sides; the black on the first segment occupies the whole base of the segment (and not the middle only, as in *C. callidus*); the Δ -shaped black spot on the second segment is rather broad in its outline, and its ends, prolonged along the hind margin, are as broad as the main body of the figure (in *C. callidus* they are usually narrower); they do not reach the lateral margin; the yellow triangle enclosed in the Δ -shaped spot is somewhat smaller than in *C. callidus*. The other abdominal segments are black, with narrow yellowish-gray margins, two or three of which expand into triangles. Legs black; base of front tibiæ, the major part of the middle tibiæ and roots of the four posterior tarsi reddish-brown. Wings: costal cell, cross-band and a narrow costal border beyond, brown; the cross-band is rather narrow and attenuated posteriorly; its distal margin is very straight; its proximal side does not fill out the proximal half of the discal cell, which is hyaline; a part of the fourth posterior cell is also hyaline; a brown cloud on the last section of the fifth vein; otherwise the fifth posterior cell likewise hyaline; the brown border along the costa, between the cross-band and the apex, is but little broader than the infuscated costal cell between the cross-band and the root of the wing, and is narrowed at its origin from the cross-band, where a subhyaline indentation almost severs it from the cross-band; the fifth longitudinal vein before the crossvein is yellow.

Hab. North Conway, N. H., where I caught two females of this handsome species in the middle of August, 1874.

The smaller size, the coloring of the face and the peculiar picture of the wings easily distinguish this species from the two preceding ones.

11. *Chrysops pudicus* n. sp.

♂. Apical spot connected with the cross-band, the hyaline triangle between them not crossing the second longitudinal vein; the apical spot invades but a small portion of the second submarginal cell; both basal cells, (except at their extreme proximal ends), hyaline; frontal callosity reddish; first and second abdominal segments yellow on the sides; the black on the second segment Δ -shaped.

Length, 5 mm.

Female. Face, including the callosities, yellowish-ferruginous; palpi reddish-yellow; antennæ: first two joints and base of third reddish, the remainder black; front with a grayish pollen; frontal callosity reddish, usually with a black margin above. Thorax with the usual stripes, glaucous above, grayish-yellow on the pleuræ. Abdomen: two first segments yellow; the first with a black spot in the middle, the second with a stout Δ -shaped black spot, not confluent with the first; in some specimens the ends of the Δ -shaped spot reach the hind margin of the second segment and expand beside it, in others they are separated from the margin by a yellow border. The third and fourth segments are yellow, with a large transverse black spot in the middle, encroached upon by the triangular enlargement of the yellow hind margin; the relative extent of the black and the yellow

are somewhat variable. The following segments are black, with yellow sides and posterior margins. Venter yellowish at the base, black at the end, the relative extent of both colors being variable. Legs: prevailing color reddish, with more or less brown at the base of the hind femora, the tip of the hind tibiae and the ends of the four posterior tarsi, the latter half of the front tibiae and the front tarsi brown. Wings: costal cell infuscated, the brown also occupying the proximal third of the first basal cell and encroaching very slightly upon the second; crossband limited posteriorly by the intercalary vein, but filling out the fourth posterior cell and thus reaching the hind margin; last section of the fifth vein enveloped in a brownish cloud; the interval between this cloud and the crossband is hyaline. The hyaline triangle, separating the crossband from the apical spot does not reach anteriorly beyond the second longitudinal vein; thus the apical spot coalesces with the crossband within the marginal cell; posteriorly, the apical spot reaches a little beyond the apex of the wing.

Hab. Massachusetts (Beverly, Cambridge, etc.) collected by Messrs. Burgess and Sanborn; three females. A fourth female specimen, belonging to the Entomol. Soc., Philad., therefore probably from the Middle States, agrees in all particulars with the others.

Obscuration. Two female specimens (Illinois and Red River of the North, by R. Kennicott), which I have before me, differ in some particulars from the typical specimens of *C. pudicus*. The crossband does not reach the hind margin, a considerable portion of the fourth posterior cell not being filled out with brown; the apical spot is somewhat narrower, the cloud on the last section of the fifth vein communicates with the crossband across the base of the fifth posterior cell; the apex of the Λ -shaped spot on the second abdominal segment coalesces with the black on the first segment, etc. This is probably a distinct species.

12. *Chrysops montanus* n. sp.

♀. Apical spot connected with the crossband, hyaline triangle between them not crossing the second longitudinal vein; both basal cells nearly hyaline, and only a little infuscated at the proximal end; frontal callosity black; facial tubercles yellowish-ferruginous; third and fourth abdominal segments with four black longitudinal spots, alternating with yellow ones.

Length, 8 mm.

Rem de. Face (including the facial callosities), yellowish-ferruginous; palpi reddish-yellow; antennae: first two joints reddish, the second mixed with black; both beset with black hairs; third joint black, somewhat reddish at the base. Frontal callosity black; front with yellowish-gray pollen. Thorax with the usual stripes, the intermediate one with a slightly more yellowish tinge than in *C. ^{pudicus} rubens*, the lateral ones yellow. Abdomen: first two segments yellow; the first with a blackish spot in the middle, under the scutellum; the second with a Λ -shaped black spot, both branches of which are less divaricate than in *C. rubens*; in my three specimens this spot does not coalesce anteriorly with the spot of the first segment; the third segment shows four longitudinal black spots on yellow ground; the intermediate pair, which is the broader, is connected anteriorly, with the branches of the Λ -shaped spot, and posteriorly, with similar spots on the fourth segment; the lateral spots of the third segment are continued only posteriorly by similar spots in the next seg-

ment; four black longitudinal stripes are thus formed, interrupted only by the very narrow posterior margins; these stripes are also continued on the fifth segment, but the black here prevails to such a degree that only faint traces of yellow are left between the black spots; the fifth segment thus appears nearly black or brown, with a yellow, more or less jagged, posterior margin; the same may be said of the sixth segment. Venter yellow; segments 3 and 4 with black lines on the sides; the last segments blackish, with yellow margins. Legs reddish; the front pair has the second half of tibiae, and the whole tarsi, the middle pair has the coxae, root of femora, knees and tips of tarsi, the hind pair the femora, except a pale ring before the knees, the latter part of the tibiae and the tips of tarsi, black; hind tibiae beset with black hairs. Wings: both basal cells hyaline, the brown color not occupying more than one-third of the first basal cell and hardly encroaching upon the second; crossband filling out the fourth posterior cell; the brown cloud, enveloping the last section of the fifth vein, communicates more or less with the crossband across the fifth posterior cell; the hyaline triangle between the crossband and the apical spot does not cross over the second longitudinal vein, although opposite its apex, at the end of the stigma, a small subhyaline dot is visible; the apical spot is like that of the preceding species, only it occupies a larger portion of the second submarginal cell.

Hab. Catskill Mountain House, N. Y., July, 1874. Two females; a third one, from Ogle Co., Illin., has the yellow on the abdomen more extensive in comparison to the black; on the legs, the red prevails to a greater extent, the hind femora being of that color. There is hardly any difference between this species and *C. pudicus* in the coloring of the wings, except that the apical spot is somewhat larger.

13. *Chrysops indus* n. sp.

♀. The apical spot fills out the marginal and first submarginal cells and invades a portion of the second submarginal; the crossband does not quite reach the posterior margin, but expands somewhat towards the anal angle; first basal cell almost filled out with brown, the second infuscated at the proximal end only. Face and facial callosities ferruginous; abdomen with yellow sides and yellow triangles in the middle.

Length, 8-10 mm.

Female. Face, including the cheeks, altogether ferruginous; only the pits existing under the facial callosities are brown; the stripes of pollen, separating the cheeks, and clothing the facial orbit, are fulvous; frontal callosity and space around the ocelli, black; pollen on the front, grayish. Antennae: first joint red, the second and base of the third more or less tinged with reddish, the remainder black. Thorax black, with the usual stripes: a grayish median stripe, margined with more distinct gray lines on each side and with a blackish longitudinal line in the middle; a pair of greenish-yellow lateral stripes, passing above the root of the wings; a broad brown stripe between the root of the wings and the humerus; pleuræ yellowish-gray, with yellowish hairs and a brown stripe in the middle. Abdomen yellow; first and second segments each with a square black spot in the middle, coalescent along the hind margin of the first segment; the spot on the second segment bears, on the hind margin, a large yellow triangle (a faint trace of a similar, but much smaller, triangle, is perceptible on the black spot of the first segment); the third and fourth segments are black, each with a narrow posterior margin, broad lateral margins, and

a triangle in the middle, yellow; an indistinct yellowish streak runs, on each side, from the anterior margin of the segment, inside of the black, and does not reach the middle of the segment; the fifth and the following segments are black, with yellow hind margins; on the fifth the vestige of a triangle. Venter yellow; blackish longitudinal lines on each side of segments 2-4; the following segments black, with yellow margins. Legs ferruginous; latter half of front tibiae and the front tarsi, black; ends of the four posterior tarsi, tips of hind femora and tibiae, blackish. Wings: costal and first basal cells, the latter except a small hyaline square at its distal end, dark brown; the proximal end of the second basal cell contains a brown streak, not quite reaching the middle of the cell; the dark brown crossband does not touch the hind margin, a small space at the end of the fourth posterior cell being hyaline; the fifth posterior cell (except both its ends) and the end of the anal cell, are also infuscated; a faint brown tinge spreads across the anal angle; the apical spot is coalescent with the crossband, marginal and first submarginal cells being filled out with brown; the second submarginal cell is encroached upon by a brown cloud on its anterior half only; a trace of a whitish halo on the distal margin of the crossband.

Hab. Two female specimens, the one from Cayuga Lake, N. Y. (J. H. Comstock), the other from Montreal (Wm. Cooper), agree in all the above described characters.

This species is very like *C. pudicus, montanus, hilaris*, etc., in its general appearance and somewhat in the coloring of its abdomen; but it is easily distinguished by the coloring of its wings, as in all the above named species the first basal cell is nearly hyaline and the first submarginal cell contains a hyaline space, separating the brown crossband from the apical spot. In *C. striatus* the hyaline spot at the end of the first basal cell is much smaller, the crossband stops short at the intercalary vein, the picture of the abdomen is altogether different, etc.

14. *Chrysops frigidus* n. sp.

♀. The apical spot fills out the marginal and first submarginal cells, and invades a portion of the second submarginal; the crossband does not reach the posterior margin, but expands toward the anal angle; basal cells infuscated on their proximal half; face shining black, with the usual stripes of yellow pollen; abdomen black, sides of the two basal segments yellow.

Length, 7-8 mm.

♂. The brown color in the basal cells occupies more space; abdomen reddish-yellow, each segment with a black spot in the middle; three last segments black.

Female. Facial callosities black, shining, prolonged anteriorly and meeting above the mouth; between them a stripe of yellowish-gray pollen; cheeks black, shining, separated from the facial callosities by broader stripes of the same pollen. Front clothed with grayish pollen; frontal callosity and space around the ocelli, black. Antennæ black, the first two joints more or less tinged with reddish; first joint comparatively stout. Thorax blackish, clothed with yellowish hairs, especially on the sides of the dorsum and on the pleuræ; a broad median greenish-gray stripe, brownish in the middle, lateral greenish-gray stripes between the humeri and the scutellum; a brown stripe between the humeri and the roots of the wings; pleuræ yellowish-gray, with yellow hairs and a blackish stripe in the middle. Abdomen black, sides of the two first segments reddish, leaving on the second segment a

more or less trapezoidal black spot in the middle: on the hind margin of the second segment, in the middle of this black spot, a gray triangle is visible: the following segments are black, with similar gray triangles in the middle (often very faint): hind margins of the segments grayish, becoming yellowish on the sides. In well preserved specimens the gray triangles and the hind margins are beset with a golden-yellow pubescence. In some specimens the reddish color on the first two segments occupies much more space, the extent of the black color being smaller in consequence: in such cases the third and fourth segments also show some reddish on the sides. Venter yellowish at the base, with more or less black in the middle: the latter half black: hind margins of the segments paler. Legs very variable in coloring, the black color prevailing in some specimens, the red in others. Wings: root, costal cells, proximal half of both basal cells, brown: the crossband does not reach the posterior margin, the distal end of the fourth posterior cell being more or less hyaline; the crossband is not limited posteriorly by the intercalary vein, but fills out more or less the proximal end of the fifth posterior and the distal end of the anal cell, where it is fainter: it even extends, but as a very faint gray tinge, into the anal angle: the apical spot is coalescent with the crossband in the marginal and first submarginal cells, which are completely filled out with brown: the second submarginal cell is brownish on its anterior half only.

Male. The thorax is more yellowish hairy, and its stripes less apparent: the abdomen is reddish-yellow: segments 1-4 with black spots in the middle, which are broader in front than behind: they do not reach the hind margins, except the spot on the first segment, which coalesces with that on the second: segments 5-7 black, with the hind margins yellow. Venter yellow: first two segments with black spots in the middle: segments 3 and 4 with a transverse blackish crossband, abbreviated on both sides: segments 5-7 black, with yellow hind margins. Wings as in the female, only the hyaline space at the distal end of both basal cells is smaller, and the prolongation of the crossband in the fifth posterior and anal cells darker.

I have before me two male specimens from Massachusetts, which I can only refer to this species, although I have not a single female from this state.

Hab. Great Slave Lake and Northwestern Regions of the British Possessions (R. Kennicott); Saskatchewan (Scudder); Quebec (Bélanger); Sharon Springs, New York. Five females. Two hypothetical males from Massachusetts.

Among all the *Chrysops* with an apical spot on the wings, this species is the only one which is not marked with ferruginous in the middle of the face: the coloring of the face here is exactly similar to that of the species of the group A; in its general appearance, it reminds one of the species of that group. This character renders its recognition very easy.

15. *Chrysops flavidus*.

Chrysops flavidus Wiedemann, Dipt. Exot., 1, 105, 5. Auss. Zweifl., 1, p. 199, 7.

? *Chrysops canifrons* Walker, List, etc., 1, p. 197.

♀. The hyaline triangle separating the crossband from the apical spot, almost reaches the second longi-

tudinal vein; basal cells infuscated at the proximal ends only; body altogether brownish-yellow, abdomen brownish above, with yellowish hind margins and triangles; thorax with three pale brown dorsal stripes.

Length, 9-10 mm.

♂. In all respects, except the sexual characters, similar to the female.

Length, 8 mm.

Female. Altogether brownish-yellow; face yellowish-ferruginous, including the facial callosities and cheeks; frontal callosity yellowish-red; pollen round the antennæ and on the facial orbits yellowish-white; on the front more yellowish. Antennæ: first two joints yellowish, beset with black hair; third joint comparatively short, reddish, its latter half dark brown. On the brownish-yellow, in some specimens grayish ground-color of the thorax, there are three brown dorsal stripes, the intermediate one narrower, linear; other brown stripes between the roots of the wings and the humeri and in the middle of the pleuræ; pectus brown. Scutellum yellowish-brown, often with a grayish tinge at the basis or on the sides. Abdomen pale brownish; first segment and base of the second yellowish, leaving a broad, subtriangular brownish spot, which occupies the whole posterior half of the second segment; a yellowish triangle in the middle of the hind margin; the following segments have more or less broad, yellow, hind margins expanding into pale yellow triangles in the middle; in some specimens, where the brown is more saturate, the yellow hind margin emits on each side of the triangle an oblique yellow streak, traversing the brown; the intensity and distinctness of the coloring of the abdomen is very variable. Feet reddish-yellow, end of front tibiae, front tarsi and the ends of all the other tarsi, brownish. Halteres brownish-yellow. The picture of the wings varies from pale brown to brown; the costal cells and the stigma are yellowish-brown; the two basal cells are infuscated on the proximal half; the first more than the second; the crossband touches the hind margin and fills out the fourth posterior cell; the last section of the fifth vein is enveloped in a brown cloud, which partly fills out the distal end of the anal cell, and also communicates with the crossband across the proximal half of the fifth posterior cell; the distal half of the anal angle has a grayish tinge; its proximal half and those portions of the anal cell and of the basal cells, which are not infuscated, are whitish hyaline; the apical spot is coalescent with the crossband in the marginal and on the anterior portion of the first submarginal cell; it does not reach beyond the anterior half of the second submarginal cell; the triangular hyaline space between the crossband and the apical spot is more or less tinged with gray in different specimens; the more gray it is, the more the whitish halo along the margin of the crossband becomes apparent.

Male. Except in the usual sexual characters, it does not differ from the female.

Hab. Newport, R. I., in August; Maryland (Uhler); British America (Scudder). I caught the male in Central Park, N. Y., Sept. 6, 1869. Seven females and one male.

Wiedemann's synonymy seems certain; Walker's is probable, although doubtful; some omission must have occurred in his description of the frontal callosity and of the antennæ. I have mentioned above, in the introductory paragraph, that the coloring of the eyes of this species, in living specimens, differs from the type of coloring which prevails in the genus *Chrysops*. The anal cell is broadly open in most specimens; in one of mine, however, it is closed.

16. *Chrysops univittatus*.

Chrysops univittatus Macquart, Dipt. Exot., 5^e Suppl., p. 36.

? *Chrysops fuscipennis* Macquart, Hist. Nat. Dipt., I, p. 216.

♀. The hyaline interval between the crossband and the apical spot does not reach the second longitudinal vein; first basal cell altogether infuscated, the second almost hyaline; apical spot large, invading the first posterior cell; a broad yellow longitudinal stripe in the middle of the abdomen, enclosed between two brown stripes; tip of the scutellum more or less reddish.

Length 6-7 mm.

♂. A considerable portion of the second basal cell is infuscated.

Female. Face ferruginous, facial callosities often brownish: frontal callosity large, black. Antennæ: basal joints and base of the third joint reddish, the remainder black. Thorax with the usual stripes; the median stripe greenish-gray, divided by a brown longitudinal line; the lateral ones yellow. Scutellum blackish at base, reddish at tip, the extent of both colors being variable. Abdomen yellow: a broad yellow stripe extends from the base nearly to the tip; it is bounded on both sides by brown stripes, which usually become much broader on the third and following segments; the tip of the abdomen is altogether brown; venter yellow, with a broad brown middle stripe, attenuated anteriorly, and narrow lateral brown lines. Legs reddish; latter half of front tibiæ and the front tarsi black; tips of the other tarsi brownish. Wings: costal and first basal cells brown; crossband limited posteriorly by the intercalary vein and filling out the fourth posterior cell; apical spot large, reaching the second posterior cell and separated from the crossband by an elongated hyaline space, very irregular and jagged on its distal side, and having its apex immediately above the proximal end of the second submarginal cell; there is a distinct brown cloud at the distal end of the anal cell, on the margin of the wing; fifth posterior cell usually hyaline; second basal cell with a brown streak on its proximal half.

Hab. District Columbia, Maryland, New Jersey, Connecticut, Kentucky (F. G. Sanborn). Eleven females.

A male, apparently belonging to this species (Tarrytown, N. Y., in June), has all the characters of the female, except that the thorax is more brownish and hairy; the brown stripes on the abdomen are not expanded posteriorly; and the brown color in the second basal cell is more extensive. The identity of this species with Macquart's *C. univittatus* can hardly be called in doubt.

C. fuscipennis Macq., Hist. Nat. Dipt., I, p. 216, is certainly one of the common species of the genus, but the shortness of the description renders the identification impossible. As far as it goes, the description reminds one of *C. univittatus* Macq., more than of any other species, especially if we take into account the statement about the small size of the species (3½ l.). Macquart has, more than once, described his own species a second time.

17. *Chrysops mœchus* n. sp.

♀. Apical spot altogether coalescent with the crossband, the hyaline triangle between them being small, included within the third and fourth posterior cells; abdomen yellow, with more or less broad brown stripes; scutellum more or less yellowish.

♂. Body altogether black, thorax with greenish-yellow lateral and pleural stripes; wings altogether

brown, except the anal angle, which is grayish, the hyaline triangle near the apex, and some hyaline spots in the fifth posterior cell.

Length, 7-8 mm.

Female. Face, including the callosities, yellowish-ferruginous; front beset with yellowish-gray pollen, frontal callosity black; antennæ: basal two joints reddish, the third black, reddish at base; palpi brownish-red. Thorax blackish, with the usual broad grayish median stripe, divided by a longitudinal black line; lateral stripes (between the scutellum and the humeri) yellow; a brown stripe separates the thoracic dorsum from the pleuræ; the latter with two yellow stripes, separated by a dark one. Scutellum reddish, with a blackish spot at the base, which, in some cases, extends as a stripe to the apex, leaving only a yellow spot on each side of the scutellum. Abdomen yellow, with four longitudinal black stripes of very variable breadth; in some specimens the intermediate pair of stripes consists of a series of disconnected blackish spots on segments 2-5, the lateral pair being obsolete; in other specimens the stripes are continuous and broader, the lateral pair beginning sometimes on the second, sometimes only on the third, segment; (the picture of the abdomen is very like that of *C. vittatus*); the two or three last segments are usually blackish; venter yellow anteriorly, blackish posteriorly. Legs reddish, latter half of front tibiae and front tarsi, black; tips of the other tarsi and, in some specimens, a considerable portion of the hind femora, black. Wings brown; second basal, anal, and fifth posterior cells, anal angle and a triangle on the hind margin, within the second and third posterior cells, hyaline; a brown cloud on the last section of the fifth vein.

Male. Face yellow, lateral callosities and cheeks black, shining; facial orbits and the stripe separating the cheeks from the callosities, are covered with a pale fulvous pollen; palpi black; antennæ black, first joint once and a half as long as the second. Thorax black, with black hairs; on each side of the dorsum, above the root of the wings, between the humeri and the scutellum, there is a distinct stripe of pollen, with an almost metallic greenish lustre, appearing yellowish in a different light; the usual median stripe on the dorsum shows a similar metallic greenish lustre, but darker and without yellow admixture; (it is almost invisible, unless the light falls obliquely from the side of the abdomen and is easily lost in worn specimens); a shade of the same pollen is visible on the scutellum; pleuræ with alternately brown and greenish-pollinose stripes. Abdomen brownish black, the lateral edge of the second, often also of the first and third segments, brownish-yellow; along the middle of the dorsum, especially on segments 3, 4, 5, a faint longitudinal stripe of grayish pollen is visible. Front legs blackish, except the base of the tibiae which is brownish; middle pair brownish, except the proximal half of femora and tip of tarsi, which are black; hind pair brownish, femora and end of tarsi black. Wings altogether blackish, except the anal angle, which is grayish; a small hyaline triangle occupies the distal half of the second and third posterior cells; small subhyaline dots are visible on the fourth longitudinal vein: before the discal cell and at the proximal end of the fifth posterior cell; a faint subhyaline streak runs across these two dots and the fifth posterior cell to the posterior margin.

Hab. I have two females from Dist. Columbia and Georgia (J. Ridings); males from Kentucky (F. G. Sanborn), Missouri (C. V. Riley), and a third specimen without indication of locality.

Although I have not received specimens of both sexes *from the same locality*, I hardly doubt that the above described male really belongs to the female described as *C. macchus*. The coloring of the body is very different in appearance, but the whole difference consists in the degree of melanism; while the characteristic traits in the coloration of the wings are the same in both sexes.

18. *Chrysops morosus* n. sp.

? *Chrysops trinotatus* Macquart, Dipt. Exot., t. 1, p. 161, 9.

♀. The hyaline triangle separating the crossband from the apical spot is narrow, acutangular, almost crescent-shaped, and reaches the second longitudinal vein only; first basal cell infuscated; abdomen brown, with three somewhat faint brownish-yellow longitudinal stripes; the intermediate one very narrow, the lateral ones often abbreviated posteriorly.

Length, 7.5 mm.

♂. Like the female, except the sexual characters.

Female. Face ferruginous; its lateral callosities brownish or black; cheeks also brownish or black, separated from the face by the usual fulvous pollen; palpi more or less brownish. Antennæ more or less reddish-yellow on the first two joints, blackish brown on the third. Frontal callosity and a small area surrounding the ocelli black. Thorax with the usual greenish-gray median stripe; lateral stripes yellowish (in some of the specimens they do not exist); pleuræ with two yellow stripes, separated by a brown one. Abdomen brown, with three brownish-yellow, often almost obsolete, longitudinal stripes; in one of my specimens the stripes reach from the base of the abdomen to the fourth segment; in other specimens, the lateral stripes, which are broader than the median one, do not reach beyond the hind margin of the second segment; sometimes the lateral stripes are barely visible as indistinct yellowish spots. Venter brown, with more or less yellow on the sides of the first two segments. Prevailing color of the legs reddish-yellow; distal half of the front tibiæ and the whole front tarsi, tips of the other tarsi, base of the femora, especially of the hind pair, and end of the hind tibiæ, black. Wings: root, costal cells and first basal cell, brown; the crossband is limited posteriorly by the intercalary vein, and completely fills out the fourth posterior cell; on the distal side the crossband is limited by a curve running from the second longitudinal vein, almost opposite the curl of the stigma, to the tip of the vein separating the third and fourth posterior cells; this curve forms the proximal side of the hyaline crescent, separating the crossband from the apical spot; the distal side of the crescent, that is, the limit of the apical spot, is less definite, but may be described as running from the same place on the second vein, across the tip of the second submarginal cell toward the posterior margin. Thus the brown color fills out the marginal cell, except a small, but very constant, hyaline dot at the end of the stigma; it fills out the first submarginal cell, except a triangular hyaline space, which is the apex of the crescent; it fills out the second submarginal cell, except its proximal end (the base of the fork of the third vein); the first posterior cell, beyond the crossband, is partly filled by the very much faded end of the apical spot, partly hyaline, (in one of the specimens the brownish tinge almost reaches the crossband). Second basal and anal cells, and the anal angle, hyaline; a hardly visible shadow on the last section of the fifth longitudinal vein sometimes communicates across the fifth posterior cell with the crossband.

Hab. Maryland, July and beginning of August (P. R. Uhler and Mus. Philad. Entom. Soc.). Six females. The single male, which I have, resembles the females in all essential characters; the yellow stripes on the abdomen are very distinct. Two females and a male, also from Maryland, are smaller, abdomen altogether brown, front tibiae, except the base, and hind legs, except base of tarsi, almost entirely brown. I am doubtful whether they belong here.

Macquart's *C. trinotatus* is very vaguely described, especially the wings, (only briefly mentioned in the diagnosis). It may or may not be *C. morosus*.

19. *Chrysops vittatus*.

Chrysops vittatus Wiedemann, Dipt. Exot., 1, p. 106, 7; Auss. Zweifl., 1, p. 200.

Chrysops areolatus Walker, List, etc., 1, p. 197.

Chrysops lineatus Jaenicke, Neue Exot. Dipt., p. 26.

♀. The hyaline triangle separating the crossband from the apical spot does not reach the second longitudinal vein; first basal cell to a considerable extent infuscated; the second at the proximal end only; frontal callosity and scutellum reddish; abdomen yellow with four longitudinal black lines.

Length, 8-10 mm.

♂. The second basal cell is, like the first, to a considerable extent infuscated.

Female. Face and facial callosities ferruginous-yellowish; *frontal callosity yellowish-red*; the pollen covering the front is yellow. Antennae yellowish-red, third joint reddish at base, brown or black toward the tip. The usual stripes on the thorax are broad and well marked, yellow; the intervening spaces are brown; of the latter, the middle one is narrow. Scutellum reddish-yellow. Abdomen yellow, with four longitudinal brown stripes, usually reaching the fifth segment; the lateral stripes usually begin on the second segment only; the sixth segment is brown, with vestiges of yellow spots and a yellow hind margin. Venter yellow, blackish at tip and with two more or less distinct brown lateral stripes. Prevailing color of the legs yellowish-red; tarsi, except at base, brownish. Wings: costal and first basal cells brown; the latter with a small hyaline space before the distal end; second basal cell hyaline, with only a small brown streak at the proximal end; anal cell and anal angle hyaline; the crossband fills out the fourth posterior cell, except a very narrow, almost imperceptible, hyaline border on the posterior margin of the wing; the apical spot is broad and fills out the whole marginal and first submarginal cells, and the greater part of the second submarginal, except its proximal end, with a corresponding little hyaline spot in the first submarginal cell; posteriorly the crossband reaches beyond the intercalary vein in the shape of a more or less distinct brown cloud, crossing the fifth posterior cell and sometimes invading the tip of the anal cell; the proximal ends of the discal and of the fifth posterior cells are usually hyaline.

Hab. Middle and Northern States; not rare. A specimen from North Conway, N. H., is much darker in its general coloring, especially on the thorax.

The male, of which I have only a single, somewhat immature specimen, is in all respects like the female, except that the second basal cell is infuscated to a greater extent.

The red frontal callosity and scutellum render this species easily recognizable, and for this reason the synonymies are hardly doubtful. Mr. Walker seems to have described as

C. areolatus a specimen which had the centres of the cells on the disc of a faded brown, as is often the case, without constituting a specific character. In the description of the abdomen some omission has occurred, which renders it incomprehensible.

20. *Chrysops striatus* n. sp.

?*Chrysops furcatus* Walker, List, etc., I, p. 199.

Chrysops vittatus Bellardi (nec Wiedem.) Saggio, etc., I, p. 74.

♀. The hyaline triangle separating the crossband from the apical spot does not reach the second longitudinal vein; first basal cell to a considerable extent infuscated, *the second altogether hyaline; frontal tubercle black, scutellum blackish at base, reddish at tip*; abdomen yellow, with four longitudinal black stripes.

Length, 7-9 mm.

Female. Very like that of *C. vittatus* in its general appearance and in the coloring of its wings. It differs however in the following points: the face is ferruginous, but the facial callosities are usually brownish; the frontal callosity is black and the pollen on the front greenish-gray; the coloring of the thorax is less yellow, the median stripe being greenish-gray, with a brown line in the middle; the scutellum is more or less blackish at the base, the posterior half only being reddish; the longitudinal stripes on the abdomen are darker and better marked, especially on the first two segment, where, in *C. vittatus*, they are very often somewhat faded; the fifth posterior cell is usually hyaline, and not invaded by a brown cloud, issuing from the crossband; the latter is limited posteriorly by the intercalary vein; the apical spot is smaller, occupying only the anterior portion of the second submarginal cell; the brown at the base of the second basal cell is confined to a small spot. Venter yellow, with a broad median brown stripe, attenuated anteriorly, and two narrow lateral stripes.

Hab. District of Columbia; Illinois. Six females.

I have two doubtful specimens from Illinois (Le Baron), with the thorax and wings of *C. striatus*, but with reddish facial and frontal tubercles.

Mr. Walker's description of *C. furcatus* seems to fit the present species better than any other; nevertheless, important discrepancies in the description prevent me from admitting the synonymy. Bellardi's *C. vittatus* is very likely this species, and certainly not *C. vittatus* Wied. (compare the color of scutellum and of the frontal tubercle).

21. *Chrysops hilaris* n. sp.

♀. Apical spot separated from the crossband by the tip of the hyaline triangle, which reaches the costa; both basal cells hyaline; the crossband does not quite reach the hind margin. Frontal and facial callosities black; third and fourth abdominal segments with four black longitudinal spots, alternating with yellow ones, sometimes coalescing in such a way as to leave but a yellow longitudinal stripe and lateral yellow spots.

Length, 8-9 mm.

Female. Face yellowish-ferruginous, facial callosities black; palpi reddish-yellow; front, antennæ and thorax as in the preceding species. Abdomen: first two segments yellow; the first with two black, rounded spots, separated by a yellow space, under the scutellum; the second with two short, diverging black streaks in the middle, which neither meet nor touch the anterior margin; the posterior margin they sometimes touch, sometimes not; the third

segment shows four longitudinal spots on yellow ground; sometimes these spots expand at both ends in such a manner as to leave only a longitudinal yellow stripe in the middle, and a round yellow spot, on black ground, each side; the fourth segment is colored like the third, so that in some cases the abdomen shows two longitudinal black stripes, reaching from the scutellum to the posterior margin of the fourth segment, and two lateral stripes on the third and fourth segments; in other cases (and, upon the whole, more frequently), the third and fourth segments may be described as black, with a yellow median stripe and, on each side, yellow spots, a pair on each segment. The last segments are black, with yellow hind margins, the fifth sometimes with a yellow median line. Venter yellow; third and fourth segments with black spots in the middle (which are nearly obsolete in some specimens), and blackish lines on the sides; the fifth and following segments black, with yellow margins. Legs as in *C. montanus* and also variable as to the extent of the black color. Wings: both basal cells hyaline, the brown color encroaching but very little upon either of them; crossband not quite filling out the fourth posterior cell, and leaving a hyaline space at its distal end and along the intercalary vein; a brown shade on the last section of the fifth vein is hardly perceptible; the hyaline triangle between the crossband and the apical spot entirely separates both and reaches the costa with its apex.

Hab. Pennsylvania; Massachusetts; White Mountains, N. H. (Scudder); Canada (Couper); Kansas (Al. Agassiz). Twelve female specimens.

22. *Chrysops fallax* n. sp.

♀. Apical spot separated from the crossband by the tip of the hyaline triangle, which almost reaches the costa; both basal cells hyaline; *the crossband reaches the posterior margin*. Facial callosities reddish or brownish, third and fourth abdominal segments with four black longitudinal spots, alternating with yellow spaces, the black sometimes coalescing in such a way as to leave but a yellow longitudinal stripe in the middle. Length, 7-7.5 mm.

Female. Very like *C. hilaris*, but with the following, apparently constant, differences: it is smaller; the end of the crossband fills out the fourth posterior cell, or very nearly so; although the hyaline triangle between crossband and apical spot crosses the second longitudinal vein, forming a large hyaline spot in the marginal cell, still a connection is left between the crossband and the apical spot, in the shape of a narrow brown shadow; the cloud on the last section of the fifth vein is somewhat more distinct; on the abdomen, *the black spots under the scutellum, separated by a yellow space in C. hilaris, are here coalescent* (this seems to be a very constant character); the converging black lines on the second segment are sometimes coalescent anteriorly; the facial callosities are usually red, often brownish on their lower half; the cheeks are also variable, from reddish to black. The abdomen is like that of *C. hilaris*, and shows the same variations as in that species; in some specimens the third and fourth segments, except a yellow stripe in the middle, and a yellow hind margin, are entirely black.

Male. Similar to the female; the proximal ends of the basal cells somewhat infuscated; thorax with erect, yellowish hairs; third and fourth abdominal segments (in the two specimens before me), yellow, with four black spots; the following segments black, with yellow hind margins.

Hab. Cambridge, Mass.; S. Amherst, Mass. (G. Dimmock); Tarrytown, N. Y.; Delaware; Maryland. Twelve female and two male specimens.

Two female specimens which I took at the Trenton Falls, N. Y., in July, 1874, have black frontal tubercles, and the feet more black than usual. I hardly doubt the specific identity of these specimens.

23. *Chrysops obsoletus* Wied.

Chrysops obsoletus Wiedemann, Dipt. Exot., i, p. 108, 10; Auss. Zweifl., i, p. 211.

♀. The hyaline triangle separating the crossband from the apical spot reaches the costa; both basal cells hyaline; *abdomen brown, with a yellow, tapering, median stripe, which does not reach the tip, and two lateral narrower, and still more abbreviated stripes.*

Length, 6.5–8 mm.

Female. Antennæ black; more or less yellowish at the base; face yellowish-ferruginous, facial callosities black; front yellowish-gray, with a large, black callosity. Thorax with the usual greenish-gray median stripe, divided by a black line; yellowish lateral stripes and yellow stripes on the pleuræ. Abdomen more or less dark brown; a yellow stripe, tapering posteriorly, reaches from the base of the first segment to the hind margin of the fourth or even the fifth segment; two lateral, narrower, yellow stripes on the first and a portion of the second, sometimes even on the third and fourth segments. Venter brown, with more or less yellow on the sides of the first three segments; a brown lateral stripe often crosses the yellow. Legs reddish, with the end of the front tibiæ and the front tarsi, the ends of the four posterior tarsi, the base of the hind femora, etc., black. Wings: two basal, anal, fifth posterior cells and anal angle hyaline; crossband almost reaching the hind margin along the vein between the third and fourth posterior cells, but leaving a hyaline space on the proximal end of the discal cell and, in the fifth posterior cell, along the intercalary vein. The hyaline triangle between the crossband and the apical spot crosses the second longitudinal vein, and touches the costa; the apical spot is of a paler shade of brown than the crossband and evanescent posteriorly.

Hab. Pennsylvania; Maryland; Manlius, N. Y. (J. H. Comstock); Cambridge, Mass. (Sept. 19); North Conway, N. H. (August, 1874). Nine females.

In some specimens the lateral stripes of the abdomen become obsolete; in others, on the contrary, a trace of a prolongation is visible on the third and fourth segments. Wiedemann mentions a specimen from Pennsylvania, in which these stripes almost reached the end of the abdomen. Sometimes the brown tinge of the costal cell is very pale.

The male of this species, according to Wiedemann, has no stripes, either on the thorax or on the abdomen.

24. *Chrysops plangens* Wied.

Chrysops plangens Wiedemann, Auss. Zweifl., i, p. 210, 22 (♀).

Chrysops fuliginosus Wiedemann, Dipt. Exot., i, p. 109, 11; Auss. Zweifl., i, p. 210, 23 (♂).

♀. The apical spot is separated from the crossband by a hyaline lunule, reaching to the costa; first basal cell infuscated; the brown design on the wing is rather pale; body altogether grayish.

♂. Altogether blackish; wings pale brownish, with some faint paler streaks.

Length ♀, 6–8.5 mm. ♂, 6.5 mm.

Female. Head gray; face ferruginous in the middle, with black, shining frontal callosities, separated from the black, shining cheeks by a stripe of yellowish pollen; antennæ

usually blackish, with a vestige of reddish at the root of the third joint (compare the observation at the end of this description). Thorax blackish, with a broad gray median stripe, divided by a longitudinal blackish line; lateral grayish stripes above the root of the wings; pleuræ grayish, with a blackish stripe. Abdomen grayish, with faint bilobed blackish spots at the base of the segments; grayish golden hairs on all segments, especially on the hind margins; venter blackish-gray, hind margins of the segments lighter gray. Legs black; tibiæ, except the ends, and base of all the tarsi, brownish. Wings of a general grayish hue; second basal cell subhyaline; the usual picture pale brownish; it consists: 1, of the infuscated costal and first basal cells (except a small subhyaline spot at the distal end of the latter); 2, of a crossband not sharply limited by the intercalary vein, and rather evanescent posteriorly, coalescing with the general grayish hue of the anal angle; 3, of an apical spot, separated from the crossband by an oblique, subhyaline streak between the end of the stigma and the proximal end of the second submarginal cell; posteriorly, a space of a more grayish hue completes the lunule between the apical spot and the crossband.

Male. Face as in the female; body altogether blackish, gray stripes on thorax hardly visible; abdomen with a faint grayish pollen, and grayish golden hairs. Wings of an almost uniform grayish-brown tinge, with only a faint outline of the usual picture; a distinct hyaline streak between the end of the stigma and the proximal end of the second submarginal cell; a double subhyaline spot at the distal end of the basal cells.

Hab. Cambridge, Mass., midsummer; New Rochelle, N. Y.; Tarrytown, N. Y., in June; New Jersey. Six females and two males.

I possess, moreover, two females and a male, which I collected in Florida, in March. The females have the base of the first and second joints of the antennæ yellowish-red; in the male, the antennæ are altogether black; otherwise I do not perceive any difference between these specimens and those from the Northern States and take them for the same species.

In Wiedemann's description some clerical error was committed in the description of the antennæ, as "yellowish antennæ with a black basal joint," seem somewhat improbable in a *Chrysops*; moreover, Wiedemann himself describes the antennæ of his *C. fuliginosus*, ♂, as "black, with a brownish-yellow root," suggesting at the same time the synonymy of this species with *C. plangens*, ♀.

I have never seen the following North American species of *Chrysops*:—

1. ***Chrysops lugens*** Wiedemann, Dipt. Exot., p. 109; Auss. Zweifl., 1, p. 212 (Savannah).

For some time I felt inclined to identify this species with the dark specimens of *C. morosus*, mentioned at the end of the description of that species. But Wiedemann describes his species as "black" and not brown, which cannot possibly apply to the darkest specimens of *C. morosus*.

2. ***Chrysops nigripes*** (Zetterstedt); Loew, Verh. Zool. Bot. Ges., Wien, 1858, p. 623.

Occurs, according to Loew, in Lapland and also in Sitka (erroneously called (l. c.) "the peninsula Sikka"). It belongs to the group with an apical spot.

3. *Chrysops quadrivittatus* Say, J. Acad. Phil., III, 33, 1 (1822); Wied., Auss. Zweifl., I, p. 200, 9. Rocky Mts.

4. *Chrysops sepulchralis* Kirby, Fauna Bor. Amer., p. 314, 1.

Whether it is really identical with Fabricius's species of that name, remains to be proved; this identification certainly shows that the species belongs to the group provided with an apical spot.

SILVIUS.

The only North American species of this genus hitherto described, *S. isabellinus* Wied., I have never seen. The following species is a true *Silvius* from the Pacific basin; it differs, however, from the European species in the presence, on the face, of shining black callosities.

Silvius trifolium n. sp.

♀. Thorax clothed with a dense yellowish pollen, abdomen reddish-yellow, at the base with three elongated blackish spots, connected at their ends in the shape of a clover-leaf.

Length 11.5 mm.; wing 10.5 mm.

Head grayish-yellow, from a dense pollen which covers it; small area ~~round~~^{angular} round the ocelli, an obovate frontal callosity and two ~~regular~~^{angular} spots on the face, below the antennæ, shining black. Antennæ: two basal joints and base of the third, reddish-yellow, the remainder black; palpi reddish-yellow. Thorax: ground color black, but altogether concealed under a thick grayish-yellow pollen; pleuræ with yellow hairs. Abdomen reddish-yellow, somewhat purer yellow on the posterior margins of the last segments, clothed with some appressed minute black hairs; the posterior margins of the segments show traces of a fringe of yellow hairs; the first segment has a blackish spot in the shape of a recumbent, elongated 8, both lobes of which are situated on both sides of the scutellum; on the second segment, in the middle, there is an elongated spot of the same color, which, with the spots of the first segment, forms a figure not unlike a clover-leaf; these spots are clothed with yellowish pollen. Venter reddish-yellow, with a trapezoidal black spot at the base. Feet reddish-yellow; knees, tibiæ and tarsal joints tipped with brown: tarsi altogether brownish towards the end; hind tibiæ beset with black hairs. Wings hyaline with a grayish tinge; the base, the costal areas and stigma tinged with yellow; the fork of the third vein has a stump of a vein.

Vancouver Island (G. R. Crotch); Washington Territory. Two female specimens.

HÆMATOPOTA.

Besides *H. punctulata* Macq., Dipt. Exot., I, 1, p. 163, from the Carolinas, which I do not know, the following species occurs in North America, and seems to be very common in the Northwest.

Hæmatopota americana n. sp.

Fem. de. Grayish-black, variegated with white lines and spots; wings grayish, with numerous irregular white streaks and a large ocellar spot, having the base of the second posterior cell for its centre. Antennæ black, first joint very much incrassated, the third somewhat pale at the extreme base only; a large, shining, black, transverse callosity above them; two velvety black spots above the callosity. Feet black; front tibiæ

at base, middle and hind tibiae at base and in the middle, with a broad white ring; first joint of middle and hind tarsi white, the tip black. Abdomen with two white spots on each segment, beginning with the third and with white posterior borders, dilated in the middle.

Length, 10-11 mm.

This species is almost identical with the European *II. pluvialis* (compare the description and the figure in Meigen, Syst. Besch., II, p. 60, Tab. 14, f. 8-16). A constant difference seems to exist in the coloring of the third joint of the antennæ, which is altogether black, except a slight vestige, often invisible, of a paler coloring at the base of the third joint, while the European specimens have the first half of the third joint more or less tinged with reddish. The first antennal joint in all my specimens is stouter than in the European specimens which I have for comparison; the front seems broader; there is no vestige of the longitudinal white line along the middle of the abdomen, which usually exists in European specimens; the white picture of the wings seems to be more marked and the design more fully carried out. However, in Europe this species is very variable and I have only a few European specimens for comparison.

Fort Resolution, Huds. B. Terr. (R. Kennicott); Lake Superior (A. Agassiz); Dacota (Dr. Coes); Southern Montana; British Columbia (Crotch). I have compared more than two dozen specimens.

DIABASIS.

Established by Macquart in the *Suites à Buffon* and in the *Diptères Exotiques*, this genus does not seem to be sufficiently defined; except the shortness of the face, in connection with it, the rather low insertion of the antennæ, and the rather broad fore tibiae, there seems to exist no appreciable character to distinguish it from *Tabanus*. It may be that some of the characters mentioned by Macquart (for instance the callosities on the face) occur in the other species which he places in the genus, but they do not exist in the only known North American species.

As it is, *Diabasis ferrugata*, besides its general appearance and coloring, which are not *Tabanus*-like, has only the coloration of its eyes to show, as a distinctive character. The direction of the stripes of the eye is very oblique, almost from top to bottom, instead of nearly horizontal, as in *Tabanus*. A purple stripe runs, between two green ones, from the vertex downward, across the eye; from the inner one of the green stripes, a green band, perpendicular to the stripe, runs crosswise toward the antennæ, dividing in two the inner and lower portion of the eye, which is purple.

Diabasis ferrugata.

Chrysops ferrugatus Fabricius, Syst. Antl., 111, 2.

Tabanus ferrugatus Wiedemann, Dipt. Exot., I, p. 94, 56; Auss., Zweifl., I, p. 186, 113.

Dichelacra ferrugata Walker, List, etc., I, p. 191 and v, p. 148.

Diabasis atenia Macquart, Dipt. Exot., I, 1, p. 152 and Walker, List, etc., v, p. 271.

Chrysops approximans Walker, List, etc., I, p. 198.

Chrysops convergens Walker, List, etc., I, p. 198.

Tabanus americanus Palisot de Beauvois, Dipt., Tab. III, f. 6.

Tabanus Rondanii Bellardi, Saggio, etc., I, p. 68, Tab. II, f. 11.

Female. Yellow; thoracic dorsum grayish, tip of the abdomen brown; tip of antennæ, front tibiæ and tarsi black; wings brown at the apex and with a brown stigma. Length, 9–10 mm.

Palpi and antennæ ferruginous-yellowish; the end of the third joint of the latter blackish or brown; face grayish; front comparatively narrow, yellowish above the antennæ, grayish above the callosity and yellowish-gray toward the vertex; callosity nearly square, blackish or black. Thorax yellowish; the middle portion of the dorsum is grayish, which color is tempered by a yellowish pollen; pleuræ and pectus, in part, gray. Abdomen ferruginous-yellowish, clothed with a golden-yellow pubescence; sixth segment brown on the sides; seventh entirely brown; (in some specimens the preceding segments also show a brownish tinge on the sides). Distal third of the front femora, the front tibiæ and tarsi black; distal half of the middle tarsi brownish; hind tarsi, except the base, and hind tibiæ, more or less brown (the hind tibiæ seem to vary in the intensity of the coloring; in one specimen they are brown, except at the base; in another the brownish coloring is hardly perceptible at all; the third holds the middle between the two); the remaining portion of the legs is yellow. Wings subhyaline; stigma brown; the apex, immediately beyond the tip of the second vein, is brown; this tinge becomes much fainter, however, toward the hind margin; a faint brown tinge in the proximal half of the first posterior cell encroaches more or less on the first basal cell and extends along the central crossveins; costal cell yellowish.

I have four female specimens before me: two from Florida and two from Mexico. One of the latter has the hind tibiæ brown except at the base.

This species occurs also in the Carolinas (Macquart), in the West Indies and Honduras (*Chrysops convergens* Walker), and in Brazil (Macquart).

The synonymy embraces not less than *six* specific names; Mr. Walker, in his List of the Diptera of the British Museum, after having identified it once as *Dichelacera ferrugata*, describes it *twice* as a new species, and quotes it a fourth time as *Diabasis atania*. The descriptions of *Chrysops convergens* Walker, and *approximans* Walker, which are beside each other, are absolutely identical; a slight difference appears in the hind legs, the coloring of which, as I have shown, is variable. The other synonymies will not seem in the least doubtful to any one who will take the trouble to compare them.

PUBLICATIONS OF THE BOSTON SOCIETY OF NATURAL HISTORY.

JOURNAL.

Vol. I, part 2, \$2.00; part 3, \$1.50.

“ II, \$6.50; Vol. II, part 1, \$2.00; part 2, \$2.00; parts 3-4, \$3.00.

“ IV, part 2, \$1.50; part 3, \$1.50; part 4, \$1.50.

Vol. V, part 1, \$1.75.

“ VI, \$6.00; Vol. VI, part 1, \$1.75; part 2, \$1.50; part 3, \$1.75; part 4, \$1.25.

“ VII, part 2, \$1.75; part 3, \$1.50; part 4, \$1.25.

PROCEEDINGS (bound).

Vols. II, III, IV, VI, VII, per volume, \$2.50.

Vol. VIII, \$2.75.

“ IX, \$3.50.

Vols. X-XVI, per volume, \$3.50 to members, \$4.50 to the public.

Vol. XVII, now issuing in quarterly parts, \$3.00 to members, \$4.00 to the public.

MEMOIRS.

Vol. I, parts 1, 2, 3, and 4, each \$3.50 to members, \$4.00 to the public.

“ II, issued in illustrated parts of quarto size, averaging

130 pages annually, \$3.50 per part to members, \$4.00 to the public.

SEPARATE MEMOIRS OF VOL. II.

PART I.

Volcanic Manifestations in New England. By Wm. T. Brigham, A.M. pp. 28. 50 cents.

Early Stages of Terebratulina. By Prof. Edward S. Morse. Two Steel Plates. pp. 12. \$1.00.

Osteology and Myology of Didelphys virginiana. By Elliot Cones, M.D., U.S.A. With an Appendix on the Brain. By Jeffries Wyman, M.D. pp. 114. \$2.50.

PART II.

Development of Limulus Polyphemus. By A. S. Packard, Jr., M.D. Three Steel Plates. pp. 48. \$2.00.

Description of the Balanoptera musculus, in the possession of the Society. By Thomas Dwight, Jr., M.D. Two Plates. pp. 28. \$1.25.

Fossil Myriapods from Nova Scotia. By S. H. Scudder. 35 cents.

Note additionnelle au Mémoire intitulé “ Volcanic Manifestations in New England.” Par M. Albert Lancaster. 35 cents.

PART III.

Embryology of Terebratulina. By Prof. E. S. Morse. Two Steel Plates. \$1.00.

List of the Birds of Western Mexico, by George N. Lawrence; with Notes on their Habits, etc., by Col. A. J. Grayson. \$1.25.

Recent changes of Level on the Coast of Maine. By Prof. N. S. Shaler. pp. 20. 40 cents.

The Species of the Lepidopterous Genus Pamphila. By Samuel H. Scudder. pp. 13. Two Plates (one colored). \$1.00.

Antiquity of Caverns and Cavern Life of the Ohio Valley. By Prof. N. S. Shaler. pp. 9. One Plate. 40 cents.

THE ENTOMOLOGICAL CORRESPONDENCE OF DR. T. W. HARRIS.

EDITED BY S. H. SCUDDER.

8vo. Portrait and 4 plates. 1869. To members, \$1.50; to the public \$5.00.

CENTENNIAL ANNIVERSARY OF THE BIRTH OF ALEXANDER VON HUMBOLDT.

Address delivered by Louis Agassiz. With an account of the evening reception.

pp. 138. 1869. 50 cents.

MEMOIRS

OF THE

BOSTON SOCIETY OF NATURAL HISTORY.

VOLUME II. PART IV. NUMBER IV.

Raymond S. Shannon
June 1916

PRODROME OF A MONOGRAPH OF THE TABANIDÆ OF THE
UNITED STATES.

PART II. THE GENUS TABANUS.

WITH APPENDIX AND INDEX TO PARTS I AND II.

By C. R. OSTEN SACKEN.

BOSTON :

PUBLISHED BY THE SOCIETY.

APRIL 20, 1876.

XVI. PRODROME OF A MONOGRAPH OF THE TABANIDE OF THE UNITED STATES. Part II.
The Genus *Tabanus*. BY C. R. OSTEN SACKEN.

Read November 17, 1875.

TABANUS.

THE total number of the hitherto described species of *Tabanus* from North America, north of Mexico, is one hundred and two. Of these descriptions thirty-four have been identified, and the names connected with them adopted in the present paper. Twenty-six other species, although identified, have been recognized as synonymous with previously described ones; and thus forty-two names remain as yet to be disposed of. It is very probable that among these forty-two names a very small number (perhaps not more than three or four) represent species really unknown to me; the large majority are either recognized as doubtful synonyms of some of the identified species, or else they are unrecognizable, on account of the insufficiency of the descriptions.

Twenty species I describe as new; not that I am convinced that none of them have ever been described before, but because I could not recognize them with any reasonable degree of probability among the forty-two unidentified species. The total number of species of *Tabanus* from North America, north of Mexico, described in the present paper, is thus brought to fifty-four.

The task of the critic, as far as descriptions go, being nearly completed, the comparative merit of the work of the different writers is brought out in a very striking light. Of Wiedemann's more than twenty species (including those of Fabricius, which we know only through Wiedemann), all but three are identified; and of these three one is very probably a species I do not know (*T. gracilis*); the second (*T. nigripes*) is as good as identified, and the name is not adopted merely because another name, by Macquart, was preferred; the third is a very doubtful Fabrician species, belonging to a difficult group and described by Wiedemann from a very imperfect specimen in Fabricius's collection (*T. marginalis*).

As long as my materials were limited, the identification of several of Wiedemann's descriptions remained doubtful; when, among closely resembling species, I did not possess the right one, I was sometimes led to identify a wrong one. But with the increase of material these difficulties vanished, and even among closely allied species the right one was recognized, thus showing the faithfulness of Wiedemann's work.

Of Mr. Walker's twenty-nine species nineteen are unrecognizable to me, seven are synonyms of other, mostly well known species, and only three are adopted. Among these three I am not very sure whether *T. catenatus* Walk. should not be better called *T. rece-*

dens Walk.; *T. fulvescens* may be only a variety of *T. bicolor* Wied.; and if I recognized *T. trijunctus*, it is principally because I remembered having seen it in the British Museum.

Macquart's descriptions, although short, are more to the point than the unmeaning descriptions of Mr. Walker. But Macquart at different times worked in different entomological cabinets, without comparing, or remembering, his former types; thus he came often to describe his own species again. Besides, he generally took but little trouble about identifying the descriptions of previous authors. Among the twenty-three species described by him six are adopted, five are synonyms, and twelve are among the unrecognized and doubtful.¹

In adopting the species of former authors I have tried to hold the middle course between too much confidence and too much skepticism. The latter is as injurious as the former, as it leads to a new increase of synonymy. With the comparatively large material which I had, besides the literal interpretation of the descriptions, a process of exclusion comes into play, which reveals probabilities almost amounting to certainties. A description is referred to a certain species, not because they exactly agree, but because no other species from the same region is known that agrees better.

During my journey to Europe, in 1859, I had an opportunity of seeing the Museums of London and Paris, and to take a few notes, some of which I could turn to account now. Unfortunately, my knowledge of North American Tabanidæ at that time was very limited, and thus the usefulness of a flying visit to those Museums was diminished in proportion. About some of Wiedemann's types in the Vienna Museum I took the liberty of addressing a few questions to Dr. Redtenbacher, the Director of that Museum. His kind answers fully confirmed the surmises I had already formed from Wiedemann's own descriptions, about the identity of two or three doubtful species.

By such means I hope, in the great majority of cases, to have avoided the two evils of misapplying old names, or of unnecessarily introducing new ones. But should I even have been occasionally mistaken, the evil is lessened by my having given full descriptions of all the species, whether old or new.

In describing, my only aim has been to enable others to recognize the object described. Tabani are variable in life; they are still more variable in collections, according to the degree of preservation of the specimens. I have purposely omitted statements which seemed unnecessary for the practical aim I had in view, and I have purposely used vague expressions, where any positive statement would have been misleading. I am far from flattering myself that in every single case my descriptions will be recognized, but I believe that the possessor of a reasonable amount of material will be able to identify most of the species with much less trouble now than before the publication of my paper. In the difficult groups of *T. abdominalis*, *tectus*, *variegatus*, of *T. longus*, or of *T. socius*, *septentrionalis*, *illotus*, — groups containing either very variable species, or several closely resembling

¹ Summary of the critical review of N. A. species (north of Mexico) described by former authors: —

Identified and adopted 34 species.

(1 Linné, 1 Forster, 1 DeGeer, 5 Fabricius,
3 Palisot, 9 Wiedemann, 2 Say, 6 Macquart,
2 Kirby, 3 Walker, 1 Loew).

Identified and given in the synonymy 26 species.

(1 DeGeer, 2 Drury, 4 Fabricius, 4 Palisot,

1 Meigen, 2 Wiedemann, 5 Macquart and
7 Walker).

Unknown, doubtful, unrecognized or unrecognized 42 species.

(2 Linné, 1 Fabricius, 2 Wiedemann, 4 Palisot, 1 Say, 12 Macquart, 1 Rondani, 19 Walker).

Total 102 species.

ones, I have described what I considered as well-defined types, indicating at the same time the aberrant types, but without deciding whether they are species or varieties. The discrimination of closely allied species in such cases, is a matter of time and of local observation.

One of the difficulties one has to contend with in describing species of *Tabanus*, is the small number of males usually found in collections, and the uncertainty, in some cases prevailing, as to what species they really belong. Among the twelve species of the subgenus *Theriopteles* I have not seen the males of more than one half, although the females were numerously represented. It would be imprudent to attempt the description of the probably numerous closely allied species of that group, without the knowledge of both sexes. Males are usually the bearers of the most distinctive and most plastic characters, and in the present genus, owing to their scarcity, they do not seem to have been sufficiently studied. A great deal remains to be learned yet from local observation on males and females caught in the same locality. Thus Dr. Zeller, in 1842, separated from the common European *T. bovinus* the closely allied *T. sudeticus*, which, in the female sex, shows but slight differences, while in the males a most marked distinguishing character exists: *T. bovinus* has the facets nearly of the same size over the whole eye, while *T. sudeticus* has the usual dividing line between large and small facets very distinctly drawn.

It will be noticed that the descriptions are not preceded by diagnoses of the species. I thought that a carefully prepared analytical table, as well as the comparisons of closely allied species, which I have placed at the end of the descriptions, sufficiently supply the place of diagnoses.

The most trustworthy characters¹ for the discrimination and description of the species of *Tabanus*, are the plastic characters taken from different parts of the head: the shape of the palpi, of the third antennal joint, of the frontal callosity and the breadth of the front itself; in the male, the shape of the head, and the relative size and distribution of the large and small facets on the eyes. Although not absolutely immutable, these characters are more so than coloring or pubescence: they have, moreover, the advantage of greater durability, and can be observed even in badly preserved and old specimens. Some of these characters, of course, do not admit of any other but of a comparative description; thus when I say "front rather broad," I suppose the reader to be acquainted with the frontal breadth in the allied species. The venation of the wings affords very few available characters; the most useful is the degree of opening of the first posterior cell at its distal end. The differences in the markings on the eyes have been used for the discrimination of certain closely allied European species. These markings are not absolutely the same in all specimens of the same species, and Zeller observes in this connection that the *position* of the crossbands is of more importance than their length or breadth. Slightly marked crossbands, with an indefinite outline, are apt to disappear altogether in some specimens (see Loew, l. c., p. 575).

The coloration of the eyes can usually be revived in dry specimens by putting them on moistened sand for a few hours. The experiment, however, does not always succeed, and

¹ To those who wish to know more about the characters available for describing species of *Tabanus*, I recommend Dr. Loew's *Zur Kenntniss der Europäischen Tabanus-Arten*

(Verh. Zool. Bot. Ges., Wien, 1858, p. 573-612) and Zeller's article in Oken's *Isis*, 1842.

often spoils the specimens (and this circumstance, in many instances where I had but a few specimens of a species, has prevented me from ascertaining the coloring of their eyes).

The coloring of the antennæ, from red to brown and black, is, in most cases, characteristic, but cannot be relied upon in every single specimen; when, for instance, the attenuated portion of the third joint, before the annulate portion, is infuscated, the extent of the brown is apt to be very variable; the two basal joints also often vary from reddish to dark brown or black in different species. The same may be said of the extent of the dark color on pale colored legs; even the femora undergo, in some cases, the most unexpected variations. Besides, the bristles and hairs covering the legs often assume different hues, according to the direction of the light falling in upon them.

The pollinose, or denuded condition of the *subcallus* (the part of the front between the callosity and the root of the antennæ) is, according to Loew, not an altogether trustworthy character, as, in some European species, for instance, *T. luridus*, it occurs adventitiously; while in others it is of a pretty constant occurrence. In the American *T. lusiophthalmus* and *rhombicus* I always found the subcallus denuded.

The coloration of the eyes of Tabani consists of crossbands, usually green (or bluish) on purplish ground, or purplish on green ground; sometimes all but one crossband disappear; occasionally the whole eye is unicolorous. I have no doubt that a more attentive study of the coloration would, in some cases, supply useful hints as to the distribution of the species in groups. The following instances of coloration have partly been seen on the living insect, partly on alcoholic specimens; in many cases the eyes have been artificially revived.

1. *T. turbidus*, *trijunctus*, *catenatus*, *abdominalis* (var.), *tener*, *tectus*, *variegatus* (probably also *T. fronto*), have their eyes colored on the same pattern, that is, there are two subparallel green bands on a purple ground, the lower one, before its outer end, bending towards the upper one. *T. molestus* and *trimaculatus* show nearly the same pattern, only the crossbands are more narrow, more parallel, and with a broader interval. All these species seem to form one natural group.

2. *T. fuscopunctatus* differs from all these species in having but a single narrow purple stripe on green ground, the lower portion of the eye being again purple.

3. *T. psammophilus* has, on blue ground, two broad green stripes, the broad interval between which contains a third much narrower green stripe.

4. *T. costalis* and *nigrovittatus* have light green eyes, with a single narrow purple crossband. *T. fulvulus* and *sagax*, evidently related to them, have besides this single crossband in the middle, two others, one above and one below, but less distinctly marked.

5. The eyes of *T. lincola* have a pattern somewhat akin to the preceding, but decidedly original. The eye is green, with a purple central band, and another above it, which is abruptly interrupted about the middle of the eye; the whole upper, outer and lower orbits of the eye have a dark purple border.

6. *T. nigrescens* and *stygius* have dark colored, greenish eyes, with a central, rather dark purplish crossband, and usually less distinct bands above and below; the bands are not half as broad as their intervals.

7. The Tabani with unicolorous eyes belong to several distinct groups: —

a. *T. melanocerus* and *nigricornis*.

b. *T. Orion* and *Actæon* seem also to have unicolorous eyes, at least I have not been able to revive the colors by moisture.

c. *T. americanus* has uniformly green eyes; those of *T. giganteus* are also unicolorous.

8. *T. Reinwardtii* has two bluish green stripes, with a rather broad interval, the lower one bent towards the upper one at the outer end, without reaching it; thus, its pubescent eyes notwithstanding, it resembles in this respect the Tabani of the first group.

9. *T. cerastes* has a single blue crossband across the middle of the eye.

10. The whole subgenus *Therioplectes* has three or four green or bluish green crossbands on purple ground (*T. zonalis* and *cinctus* have four dull green bands, *T. trispilus* four bright ones, etc.).

These instances plainly show the connection which exists between the coloring of the eye and the relationship of the species; but they show at the same time the great variety of types which exist within the genus *Tabanus*.

The subdivision of the genus *Tabanus* into smaller genera, natural groups or subgenera, lies beyond the scope of the present paper. In order to be carried out successfully, such an attempt would require the study of the species from all parts of the world. *Tabanus*, on the whole, is a remarkably compact genus, but with a great variety of specific types. The wiser course, perhaps, will be to treat the subdivisions as subgenera only, providing them, however, with separate names, as has been done in the genus *Trypeta*. I will confine myself here to a few remarks about the subgenus *Therioplectes*, proposed by Dr. Zeller in 1842 for the Tabani with pubescent eyes. The subgenus thus defined contains some heterogeneous elements in Europe (*T. rusticus* and *fulvus*), and still more so in North America. We improve the definition of this group, however, through the use of a character which has been hitherto neglected, but which seems to be a character of higher order, that is, more indicative of a natural relationship than the pubescence of the eyes; I mean the presence of a more or less distinct ocelligerous tubercle on the vertex. Often a rudimentary ocellus is perceptible upon the tubercle; sometimes quite distinctly (for instance, in *T. cinctus*, as was already noticed by Meigen). This character, more distinct in the female, is often also visible in the male. The ocelli seem to be rudimentary, and should not prevent the absence of ocelli from being quoted among the characters of the genus. The new definition, as far as applicable to the American species, would run thus:

THERIOPLECTES. Eyes pubescent; ocelligerous tubercle more or less distinct; eyes (♀) with three or four bright green or bluish crossbands; head of male not differing much in size and shape from that of the female; the difference in size between the large and small facets upon it is but very moderate, and hence the line dividing them rather indistinct (especially in dry specimens).

Thus limited, *Therioplectes* forms a rather homogeneous group of twelve American species (Nos. 43–54). The two species *T. bicolor* and *fulvescens*, as well as their relatives, the European *T. fulvus* and *rusticus*, would be excluded from it and form a separate group, which I propose to call **ATYLOTUS**, and which may be characterized as follows: —

ATYLOTUS.¹ Eyes pubescent, no vestige of an ocellar tubercle; frontal callosity wanting in the two American species (or small and rudimentary, in the European species); head rather large, very convex anteriorly, and rather concave posteriorly; difference in size between the large and small facets in the male considerable, line of division between them very distinct (even in dry specimens); palpi (♀) stout at base; upper branch of the third longitudinal vein knee-shaped at base (emitting a stump of a vein in the European species); first posterior cell broadly open; coloration of the eyes uniform (sometimes a single indistinct stripe). The coloring of the eyes I quote after European authors; I do not know that of the American species, but have little doubt, from the appearance of the dry specimens, that it is the same as in the others.

The next relative of *Atylotus* in North America would be *T. mexicanus*, which is very nearly an *Atylotus* with glabrous eyes. And again the group of *T. costalis*, *niigro-vittatus*, *fulvus*, *sagax*, with their stout palpi, broadly open first posterior cell, green eyes, somewhat knee-shaped basis of the upper branch of the third longitudinal vein, etc., seems likewise to be related to *Atylotus*.

Of the total number of North American *Tabani* described by me, only two (*T. punctifer* and *T. rhombicus*) belong to the region beyond the western plains, and therefore fifty-two inhabit the region east of the plains, that is, the valley of the Mississippi, the Atlantic States and the British Possessions. The fauna of this region, especially of the Southern States, is far from being exhausted, and the number of species will certainly reach far beyond sixty. At present I know already about half a dozen species, which I have seen in collections and have not introduced in this paper, not wishing to describe new species in this difficult genus from single specimens, except in cases where a species is as striking as *T. cynnotophorus*, and where the specimen was uncommonly well preserved. Twenty-four species I know to occur in the New England States alone, and even this number will undoubtedly be increased. For comparison's sake I will state that Zetterstedt has twenty-four species for Sweden, Norway, Denmark and Finland; Schiner thirty-two for Germany and Austria; Zeller thirteen for Silesia. As yet not a single species of *Tabanus* common to Europe and North America has been ascertained to exist, although some of the northern species of the group *Theriopteetes* come very near to European species (for instance, my *T. socius* to *T. tropicus*). It is not improbable that with a better knowledge of that group some cases of undoubted identity will be disclosed.

All the original specimens of my descriptions, as well as all the varieties and aberrant specimens mentioned in my text, are to be found at the Museum of Comparative Zoology, in Cambridge, Mass. The most important contributions from abroad I received from the Entomological Society in Philadelphia, and from the Detroit Scientific Association²; for both of which I return my sincere thanks.

OBSERVATIONS ABOUT THE ANALYTICAL TABLE OF THE SPECIES.

1. As the pubescence of the eyes, in female specimens especially, is sometimes very difficult to perceive, either being naturally scarce, or worn off, I have introduced the ocelligerous tubercle as an auxiliary character. I know of no North American *Tabanus* with a distinct ocelligerous tubercle and, at the same time, with glabrous eyes in both sexes; so

¹ *Ἀτίλωτος*, without callosity.

² Diptera collected in Florida, by Messrs. Hubbard and Schwarz.

that, whenever a species possesses that tubercle, it must be looked for among those with pubescent eyes, even when the pubescence is not apparent. Hitherto I have found only four North American species which have pubescent eyes and *no ocelligerous tubercle*. Two of them (*T. bicolor* and *fulvescens*) at the same time have no frontal callosity, and for this reason cannot be easily mistaken. The two others are *T. Reinwardtii* and *T. cerastes*, and for both a double reference has been introduced, so that the right names will be found, even if the pubescence of the eyes should be overlooked. The same precaution of a double reference will be found for *T. rhombicus*, whose ocellar tubercle is indistinct.

2. Of *T. Meyerlei* I have a single damaged specimen: I place this species hypothetically among those with glabrous eyes, and, consequently, without ocellar tubercle.

3. The table has been constructed principally for female specimens. Male specimens also can be determined by it, but with a certain caution, as the abdominal markings, which were used a great deal for the discrimination of the species, are generally less well defined in that sex than in the females.

4. I need hardly add that the table will be found useful for determining normally colored and tolerably well preserved specimens, and not for very aberrant or ill-used ones.

ANALYTICAL TABLE OF THE SPECIES.

- | | | |
|----|---|--------------------------------|
| 1. | { Eyes glabrous; ocelligerous tubercle absent | 2. |
| | { Eyes pubescent; ocelligerous tubercle absent | 38. |
| | { Eyes pubescent; ocelligerous tubercle present (subgenus <i>Theriotplectes</i>) | 41. |
| 2. | { Abdomen with definite white markings ¹ (altogether white in No. 18) | 3. |
| | { Abdomen without any definite white markings | 28. |
| 3. | { The white markings of the abdomen consist in a single longitudinal row of white triangles. | 4. |
| | { The white markings, etc., consist of two or three rows of white triangles or spots | 16. |
| | { The white markings, etc., consist in a distinct white or yellowish longitudinal stripe, running from the scutellum to the end of the sixth segment | 24. |
| 4. | { Wings distinctly spotted or clouded with brown (spots sometimes faint only in No. 5); antennæ uniformly red | 5. |
| | { Wings distinctly spotted or clouded with brown; third antennal joint red, but its attenuated portion black or brown | 9. |
| | { Wings with more or less faint clouds on the crossveins and the bifurcation of third vein; prevailing color of the antennæ black or brown. | 11. |
| | { Wings without any vestiges of clouds on the crossveins and on the bifurcation of the third vein | 13. |
| 5. | { Longitudinal veins of the wings broadly clouded with brown; frontal callous much longer than broad, brownish red; first posterior cell broadly open | 1. turbidus Wied. |
| | { Crossveins and bifurcation of the third vein alone clouded with brown | 6. |
| 6. | { Prevailing color of the front femora dark brown | 7. |
| | { Front femora altogether red | 8. |
| 7. | { Front tibiae brown at tip. | 2. fronto n. sp. |
| | { Front tibiae altogether red | 3. triligatus Walk. |
| 8. | { Brown spots on wings large and conspicuous; third antennal joint almost crescent-shaped, its upper angle being drawn out in a long point | 4. fuscopunctatus Macq. |
| | { Brown spots on wings but little conspicuous; third antennal joint not crescent-shaped; abdomen coarctate posteriorly; abdominal triangles long and narrow | 5. catenatus Walk. |

¹I call *definite markings* the triangular spots, or oblique lateral spots, or the dorsal line, which occur in some species, and *not* the whitish or yellow coloring of the hind or lateral margins of the segments.

9. { Wings tinged with brownish, but without distinct brownish border posteriorly 10.
 { Wings whitish in the middle, with a brownish border along the hind margin; thorax gray, abdomen reddish **8. variegatus** Fab.
10. { Head (♂) subhemispherical; prevailing color of the thorax (♂, ♀) grayish-black; of the abdomen (♀) brownish red with white triangles **6. abdominalis** Fab. } *see last p. note*
 { Head (♂) but little different from that of the female; prevailing color of the thorax (♂, ♀) brownish gray or grayish brown; abdomen yellowish brown with white triangles. **7. tectus** n. sp.
11. { Abdomen black, with very distinct white triangles 12.
 { Abdomen reddish, with very faint white triangles. **11. tener** n. sp.
12. { A white triangle on second abdominal segment **9. molestus** Say.
 { No white triangle on second abdominal segment; venter with a broad brown longitudinal stripe. **10. trimaculatus** Palisot.
13. { Antennæ black, third joint sometimes reddish at base; abdomen on each segment, with a distinct border of gray pollen, expanding into a triangle in the middle 14.
 { Antennæ reddish, third joint more or less dark towards the end; abdomen with triangles which are not the expansion of a border of gray pollen 15.
14. { First posterior cell distinctly coarctate; prevailing color of the tibiae whitish **12. melanocerus** Wied.
 { First posterior cell not coarctate; prevailing color of the tibiae black **13. coffeatus** Macq.
15. { Front tibiae almost uniformly colored **14. Orion** n. sp.
 { Distal half of the front tibiae distinctly darker than the proximal **15. Actæon** n. sp.
16. { Wings with distinct black spots or clouds 17.
 { Wings without black spots or clouds 19.
17. { Brown spots only on crossveins and on the bifurcation of third vein 18.
 { The brown spots extend far beyond the crossveins, and give the wing a variegated appearance. **17. vennstus** n. sp.
18. { The white triangles in the middle of the abdominal segments coalesce with the lateral oblique spots, the segments being broadly margined with white posteriorly **16. cymatophorus** n. sp.
 { The white triangles, etc., do not coalesce with the lateral oblique spots (see No. 41, *T. Reinwardtii*)
19. { Abdomen uniformly white; a distinct stump of a vein on the anterior branch of the fork of the third vein **18. psammophilus** n. sp.
 { Abdomen with white triangles and white lateral spots on the segments 20.
20. { The lateral spots on the abdominal segments touch the hind margin of the segments¹ 21.
 { The lateral spots, etc., do *not* touch, etc. 23.
21. { Upper angle of the third antennal joint drawn out in a long joint (see No. 42, *T. ecrastes*).
 { Upper angle, etc., *not* drawn out in a long joint 22.
22. { Prevailing color of the abdomen white. **19. nivosus** n. sp.
 { Prevailing color of the abdomen black **20. vivax** n. sp.
23. { Middle sized, elongated species **21. longus** n. sp.
 { Small species, third antennal joint remarkably broad **22. pumilus** Macq.
24. { On each side of the median abdominal stripe there is a lateral stripe (composed of coalescent spots; sometimes indistinct) 25.
 { On each side, etc., there is a longitudinal row of yellowish or whitish, not coalescent, spots 27.
25. { Costal cell hyaline; front (♀) distinctly convergent anteriorly **23. lineola** Fab.
 { Costal cell yellowish 26.
26. { Face whitish; thorax gray, hind tibiae faintly brownish at tip **24. nigrovittatus** Macq.
 { Face yellowish; thorax grayish yellow; hind tibiae distinctly black at tip **25. costalis** Wied.

¹In order to obtain a good view of this character, raise the specimen to about the level of your eye, with the tail end towards you; pay especial attention to segments three, four,

etc., as on the second segment, the spots are sometimes very nearly contiguous with the hind margin.

27. { Lateral abdominal spots yellowish; front narrow; upper angle of third antennal joint prominent; femora usually dark. **26. fulvulus** Wied.
 { Lateral abdominal spots whitish; front broad; upper angle of third antennal joint very shallow; femora reddish **27. sagax** n. sp.
28. { A distinct frontal callosity present 29.
 { No frontal callosity **38. mexicanus** Linn.
29. { Both abdomen and palpi black 30.
 { Either abdomen or palpi not black 35.
30. { Prevailing color of thorax and wings not black 31.
 { Prevailing color of the whole body black 33.
31. { Thorax dark brown above; wings subhyaline, with brown clouds on crossveins. **28. nigrescens** Palisot.
 { Thorax densely clothed with white pollen or down 32.
32. { Front tibiae white at base. **29. punctifer** n. sp.
 { Front tibiae not white at base **30. stygius** Say.
33. { Front unusually broad, callosity transverse. **31. atratus** Fab.
 { Front not unusually broad, callosity not transverse 34.
34. { Narrow portion of the third antennal joint not remarkably elongate . . . **32. Wiedemanni** n. sp.
 { Narrow portion, etc., remarkably elongate **33. lugubris** Macq.
35. { Abdomen broadly red on the sides, black in the middle 36.
 { Abdomen black or brown. 37.
36. { Legs and palpi pale reddish **34. rufus** Palisot.
 { Legs and palpi dark **35. Megerlei** Wied.
37. { Wings hyaline, with a dark brown costal cell **36. americanus** Förster.
 { Wings uniformly brownish yellow **37. giganteus** DeGeer.
38. { Abdomen without white spots; front (♀) without callosity 39.
 { Abdomen with three rows of white spots; frontal callosity distinct. 40.
39. { Pectus and pleurae yellowish **39. bicolor** Wied.
 { Pectus and pleurae gray **40. fulvescens** Walk.
40. { Gray; third antennal joint not very deeply excised¹. **41. Reinwardtii** Wied.
 { Light chocolate brown; third antennal joint deeply excised, almost crescent-shaped **42. cerastes** n. sp.
41. { Prevailing color of the body pure black or brown. 42.
 { Prevailing color of the body grayish black or blackish gray; sides of the abdomen often reddish (large group of northern species). 45.
42. { Abdomen with conspicuous yellow crossbands. 43.
 { Abdomen without yellow crossbands 44.
43. { Ante-alar tubercle black; the yellow abdominal crossbands consist of a narrow fringe of pale yellow hair **43. flavipes** Wied.
 { Ante-alar tubercle reddish; yellow crossbands broad, formed by yellow hair on a broad border of yellowish pollen **44. zonalis** Kirby.
44. { Three first abdominal segments bright orange red, the rest black **45. cinctus** Fabr.
 { Abdomen with a white triangle on each of the segments two, three, four; body of male brownish black; of female grayish black (dark slate color) **46. trispilus** Wied.
45. { Abdomen with a conspicuous row of white triangles in the middle of the segments, but without lateral white spots (see No. 46, *trispilus* Wied., female).
 { Abdomen rufous on the sides, this color leaving only a narrow black stripe of the first three or four segments. 46.
 { Abdomen on each side with a conspicuous row of white or whitish spots; the rufous color less apparent, or not existing. 48.

¹ If the species to be determined is from the far west (Colorado Mountains, etc.), compare at this place *T. rhombicus* (No. 54), the ocellar tubercle of which is often not denuded, and might be supposed wanting.

- | | | | |
|-----|---|---|----------------------------------|
| 46. | { | Crossveins and bifurcation of third vein with distinct brown clouds; lateral whitish spots on abdominal segments distinct | 47. lasiophthalmus Macq. |
| | { | Crossveins and bifurcation of third vein not clouded; lateral whitish or yellowish spots on abdominal segments indistinct | 47. |
| 47. | { | 17-20 mm. long. Second joint of palpi narrow | 48. affinis Kirby. |
| | { | 15-16 mm. long. Second joint of palpi stout at base. | 49. socius n. sp. |
| 48. | { | The lateral whitish spots on abdomen do not ¹ touch the hind margins of segments | 49. |
| | { | The lateral whitish spots on abdomen rest with their broad base on the hind margins of segments | 50. |
| 49. | { | Third antennal joint rather narrow, and hardly excised at all; crossveins and bifurcation of third vein without any clouds | 50. septemtrionalis Loew. |
| | { | Third antennal joint moderately broad and distinctly excised; crossveins and bifurcation of third vein with faint brown clouds | 51. illotus n. sp. |
| 50. | { | Second joint of palpi stout at base | 51. |
| | { | Second joint of palpi narrow and rather long | 53. astutus n. sp. |
| 51. | { | Bifurcation of third vein without any vestige of a cloud; third antennal joint remarkably narrow, not excised; subcallus not denuded (eastern species) | 52. microcephalus n. sp. |
| | { | Bifurcation of third vein with a faint vestige of a brown cloud; third antennal joint, although narrow, still with a distinctly projecting upper angle; subcallus denuded, black, shining (western species) | 54. rhombicus n. sp. |

DESCRIPTION OF THE SPECIES.

A. Tabani with glabrous eyes, and without ocellar tubercle.

1. *Tabanus turbidus*.

Tabanus turbidus Wiedemann, Auss. Zw., I, p. 124, 20.

Female. Palpi reddish, with minute black hairs; face yellowish gray, antennæ ferruginous; upper angle of the third joint sharp, projecting, but not drawn out in a point; annulate portion of the third joint rather long, but little shorter than the body of the joint, the single joints composing it very well marked; front yellowish gray, distinctly narrowed anteriorly, darker brown in the middle; frontal callus brownish red, fully twice as long as it is broad; above it a smooth stripe of the same color (sometimes bifurcate at its upper end). Thorax with a grayish pollen, forming more or less distinct longitudinal stripes; the reddish brown or brownish red ground color is distinctly visible between them; scutellum concolorous with the thorax, and also covered with a grayish pollen; pleuræ uniformly dull whitish yellow. Abdomen brownish, with a white spot in the middle of the first segment and with large triangular spots of the same color on segments 2-6; these spots do not differ much in size, that on the sixth segment alone being smaller; the whitish borders on the hind margins of the segments are rather narrow, but expand laterally. Venter brownish red, with whitish incisures. Legs brownish red, hind tibiae with a but little conspicuous fringe of black hair. All wing veins (longitudinal as well as crossveins) are broadly margined on both sides with brown clouds, the interior of the cells remaining subhyaline; posterior margin of the wings also faintly margined with brown; first posterior cell broadly open. Length, 20-22 mm.

Hab. Georgia (J. Ridings); Kentucky (Wied.). Four females. Will be easily recognized by the peculiar coloring of its wings, the very long and comparatively narrow red-

¹ See the foot-note on page 427; in *T. illotus* the whitish spots on the second segment often have the appearance of reaching the hind margin, as the white pubescence, covering them in well preserved specimens, extends to that margin.

dish frontal callus, the long annulate portion of the antennæ, the broadly open first posterior cell, the front coarctate anteriorly, etc. In some specimens the brown clouds along the longitudinal veins are almost evanescent.

The eyes of the female have two purplish green stripes, the lower one bending towards the upper one near the end; their broad interval becomes broader externally.

I have three specimens, one labelled Western States, the second Northern States, the third, Illinois, which, besides almost obsolete clouds on the wings, have the third antennal joint brownish, except at the base. In the plastic characters of the head, and in the broad opening of the first posterior cell, they resemble the typical specimens. I refer them to this species with a doubt.

Wiedemann's description is rather indefinite, but with the aid of some additional information about the typical specimens in Vienna, kindly communicated by Dr. Redtenbacher, I believe I have fully identified this species.

T. fusconereus Macq. (without locality) may be this species, but the description is too incomplete for identification.

2. *Tabanus fronto* n. sp.

Female. Palpi reddish, densely clothed with minute black hairs, which give them a brownish appearance; face yellowish gray, cheeks with yellow pile; antennæ ferruginous; basal joints clothed with minute black hair; the upper angle of the third joint sharp, projecting but not drawn out in a point: the annulate apex of the third joint about half the length of the body of the joint, or a little less; front yellowish gray, with a brownish spot in the middle; nearly parallel, and rather broad; callus broad, nearly square, chestnut brown, prolonged in a narrow line above. Thorax with a grayish pollen, forming longitudinal stripes; the reddish brown or brownish red ground color is distinctly visible between them; scutellum of the same color with the thorax, but covered with a grayish pollen. Pleuræ yellowish gray, with blackish hairs in the middle. Abdomen brownish, with a whitish spot in the middle of the first segment, and with whitish triangular spots on segments 2-6; these triangles are smaller than in *T. turbidus*; they are nearly of the same size, except those on the last segments, which are somewhat smaller; incisures whitish, the white border being broader on the sides. Venter brownish, reddish near the basis and with broad whitish incisures. Legs brownish red; the ends of the front tibiæ, the front femora and tarsi brown; the tip of the four posterior tarsi are more or less infuscated; the four posterior femora are beset with black hairs, which give them a darker appearance. The wings have a yellowish brown tinge, more saturate on the basal half; the crossveins at the base of all posterior cells, and the bifurcation of the third vein, are marked with large dark brown clouds; distal end of the first posterior cell distinctly coarctate. Length, 17-18 mm.; some specimens much smaller.

Hab. Georgia (James Ridings). Five female specimens.

This species may perhaps be confounded with *T. trijunctus*; the latter is easily distinguished however, by the ferruginous front tibiæ, not brownish at tip, the dark brown frontal callus; the dark brown scutellum, margined with red behind, etc. The average size of *T. trijunctus* is larger, its general coloring, including the wings, is darker; the white abdominal triangles are larger; the brown spots on the wings are smaller; at the base of the

third posterior cell there is only a vestige of a cloud, while in *T. fronto* the cloud there is nearly equal to that at the base of the second posterior cell.

3. *Tabanus trijunctus*.

Tabanus trijunctus Walker, List, etc., V, p. 182.

Female. Palpi reddish, dotted with minute black hairs; face grayish yellow, cheeks with yellow pile; antennæ ferruginous; the upper angle of the third joint sharp, projecting, almost rectangular; the annulate portion, in length, about equal to three-quarters of the body of the joint; front yellowish gray, nearly parallel; callus convex, dark brown, rounded above, and with a spindle-shaped prolongation. Thorax reddish brown, with but indistinct stripes of grayish pollen; pleuræ grayish yellow with some blackish hairs in the middle. Scutellum dark brown, its hind border reddish (in well preserved specimens this color is concealed under a covering of golden yellow pile). Abdomen blackish brown; the hind margins of the segments with yellowish white borders, expanding into large triangles in the middle; first and second segments often reddish on each side. Venter brown; hind margins of segments with whitish bands. Legs ferruginous red; front femora, except the tip and front tarsi blackish brown; tips of the other tarsi brownish, hind tibiae with a distinct fringe of rufous hairs. Wings brownish, tinged with ferruginous on the proximal half and along the costa; brown clouds on the bifurcation of the third vein, and on the transverse vein at the base of the second posterior cell; central crossveins also clouded, posterior cell coarctate. Length, 17–21 mm. I have seen a specimen only 15 mm. long.

Hab. Florida. Seven female specimens, partly from my own collecting, partly from Messrs. Hubbard and Schwarz. (Ft. Capron, Florida, April 21–24.)

The differences between this species and *T. fronto* have been fully explained under the head of the latter.

4. *Tabanus fuscopunctatus*. See *supp. p. IV*.

Tabanus fuscopunctatus Macquart, Dipt. Exot., 4^e Suppl., p. 34, 108.

Female. Palpi reddish; face grayish yellow in some specimens, with brown hairs on the cheeks, in others these hairs are yellowish; antennæ red; third joint almost crescent-shaped, its upper angle being drawn out in the shape of a curved point, or horn; front grayish yellow; callus chestnut brown, with a linear prolongation above. Thorax of a dark reddish brown, with a slight grayish pollen; a tuft of whitish hairs on each side, between the root of the wings and the scutellum; the latter dark reddish brown; pleuræ clothed with dense yellowish hairs, especially near the humerus, and under the root of the wings; in some specimens there is a tuft of black hairs in the middle. Abdomen reddish brown or blackish brown; a subtriangular small white spot in the middle of the hind margin of segments 1–6; no perceptible white border on the hind margins of the segments, except on the sides, which show the usual triangles of appressed pubescence. Venter brown; incisures yellowish white; in an oblique light the whole venter appears sericeous, from a microscopic whitish pubescence. Legs reddish, sometimes brownish red; hind tibiae with a distinct fringe of hair. Wings subhyaline on their distal and posterior half; large and well marked blackish brown clouds on the central crossveins, the crossveins at the base

of the second and third posterior cells, and on the bifurcation of the third vein; costal cell, stigma and proximal half of the fifth vein, brownish ferruginous, sometimes brownish; basal cells also somewhat infuscated; extreme tips of the second vein and of the upper branch of the third vein in some specimens slightly clouded with brown. Length, 21–25 mm.

Hab. Florida; South Carolina; Georgia (Macq.); seems to be a common species (Sea Islands, S. C., June 2d, B. P. Mann; Haulover, Fla., March 16, Sand Point, Fla., March 21, E. Schwarz; Indian River, Fla., E. Palmer). I have seven female specimens before me.

This species is easily distinguished from the two preceding by the shape of the third antennal joint, the upper angle of which is drawn out in a long point, the uniformly red or reddish brown coloring of the legs, the more hyaline posterior half of the wings, the much smaller white spots on the abdomen, etc. The shade of the brown on the body is not unlike that of *T. americanus*, which species also resembles *T. fuscopunctatus* in the conspicuous white tufts of hair above the root of the wings, the color and shape of the antennæ, etc. The hairs on the cheeks and pleuræ of this species are very variable in coloring.

T. fuscopunctatus differs in many respects from the group of species (No. 1–11), among which it is here placed, — in coloring and markings, in the shape of the third antennal joint and in the coloring of the eyes. The latter, instead of having the two nearly parallel green stripes, common to all those species, have a single narrow green stripe on purple ground, the lower portion of the eyes being again green.

Macquart describes a damaged specimen, and for this reason does not mention the spots on the abdomen; the description of the antennæ, the comparison to *T. ruficornis* (Syn. *T. americanus* Förster), etc., leaves no doubt about the identification.

5. *Tabanus catenatus*.

Tabanus catenatus Walker, List, etc., I, p. 148.

Female. Palpi pale reddish; face pale yellowish white; antennæ pale red; annulate portion of the third joint nearly as long as the body of the joint, its upper angle sharp, projecting, but not drawn out; front yellowish gray, callus reddish brown, with a somewhat spindle-shaped prolongation above. Thorax reddish brown, the usual longitudinal lines of yellowish white pollen very distinct; pleuræ yellowish white or whitish yellow, clothed with long hairs of the same color; a short streak of black hair above the root of the wings. Abdomen distinctly attenuated posteriorly, brown above, each segment with a narrow and long white triangle in the middle; sides of the abdomen margined with a yellowish white pubescence; ground color of the venter brown, concealed under a dense microscopic whitish pubescence; incisures whitish. Legs reddish or brownish red, tarsi somewhat darker. Wings slightly tinged with brownish, more distinctly pale reddish brown near the basis and in the costal cell; central crossveins, crossveins at the base of the second and third posterior cells and the bifurcation of the third vein, more or less distinctly, although not very strongly, clouded with brown; the first posterior cell is not perceptibly coarctate. Length, 23–24 mm.

Male. Head but little larger than that of the female, and but a little more convex; large and small facets distinctly separated; the large ones, however, not quite so large as in other species. The abdomen usually a little paler brown than in the female. Length, 20–21 mm.

Hab. New York, Pennsylvania, Maryland, South Carolina (B. P. Mann); Connecticut (Southington, in July; W. H. Patton). I have three males and two females before me.

This species is easily distinguished from its relations by the shape of the white abdominal triangles, which are long and narrow, two or three times longer than broad, and not nearly equilateral, as in the other species. The shape of the abdomen is very peculiar, as it appears laterally compressed towards the tip (I did not take note, however, how the abdomen appears in the living specimens). The brown clouds on the wings are less marked in this species than in the three preceding ones; sometimes they are nearly obsolete.

The eyes of the female have two rather broad green bands on purple ground; the lower band at the end is bent toward the upper one; thus the interval between them, very narrow near the front, becomes broader at the opposite end.

T. catenatus Walker (Massachusetts) seems to agree with this species, although the identification is not certain. The *variety*, described by Walker, Vol. V, p. 172, is a totally different species. *T. recedens* Walker, may also be this species; but the description does not agree so well as that of *T. catenatus*.

6. *Tabanus abdominalis*.

Tabanus abdominalis Fabricius, Syst. Antl., p. 96, 15. (*Museum Bosc.*)

? *Tabanus abdominalis* Palisot Beauvois, Ins., p. 101, Tab. II, f. 4. (1809.)

? *Tabanus abdominalis* Wiedemann, Dipt. exot. I, p. 65, 6; Auss. Zw., I, p. 116, 7.

This species and the next following are either unusually variable, or there are several closely allied species, very difficult to distinguish. With the material which I have before me I am unable to unravel these difficulties, and I believe that they can be solved only by observations made in the localities where these species occur, observations which would define the limits of the variation of each species.

I will first describe here that species, or variety of a species, which I take to be nearest to the original type of Fabricius's description; and having done this, I will proceed to describe the different forms which I have before me, and which may be either mere varieties or distinct species.

An incidental remark of Macquart's, in the introductory paragraph to the genus *Tabanus* in the first volume of the *Diptères Exotiques* (p. 116), throws more light on Fabricius's *T. abdominalis* than the author's short descriptions. Macquart names *T. abdominalis* among the species with a closed first posterior cell. Where did he derive the knowledge of this character? *T. abdominalis* does not appear anywhere else in his works, nor is the character mentioned in Fabricius or Wiedemann. The probable and only possible explanation is, that he saw in the Museum of the Jardin des Plantes, the specimen of Bosc's collection originally described by Fabricius, as expressly stated in the *Systema Antliatorum* (Bosc's collection, as well known, is incorporated in that of the Museum). If the specimens from Fabricius's own collection, which Wiedemann described, or his own specimens, had had a closed first posterior cell, that conscientious and careful author would certainly have mentioned this character, rather unusual among *Tabanidæ*. Wiedemann's silence proves that the specimens which he saw had the first posterior cell open; in Palisot's figure that cell is also represented as open; and, in fact, the specimens with a closed cell are comparatively rare.

As the original *T. abdominalis* Fab. had the first posterior cell *closed*, we will begin by describing, as typical, the specimens partaking of this character, without inquiring, for the present, whether it is specific or merely adventitious.

Female. Face pale yellowish gray with pale hair on the cheeks; palpi dusky yellowish, with short black hair, which gives them a darker appearance; front rather narrow, brownish, mixed with gray; frontal callus longer than broad, chestnut brown or dark brown, with a somewhat spindle-shaped prolongation above; antennæ red; basal joints clothed with short black hair; third joint rather broad, with a rather rectangularly projecting upper angle; annulate portion black, the region immediately preceding it often more or less brownish. Thorax brownish gray, with alternate gray lines and darker stripes; the former, in well preserved specimens, are clothed with short, golden yellow hairs (visible under the lens only). Pleuræ of a dingy yellowish gray, with hairs of the same color; a fringe of blackish hair above the root of the wings. Scutellum brownish at the base, more reddish posteriorly. Abdomen brownish rufous, with whitish triangles in the middle of the segments, those on segments 2-4 differing but little in size, that on segment five smaller; a distinct black spot clothed with black pile intervenes between the apex of the triangle on the second segment and the hind margin of the first. The hind margins of the segments have borders of fulvous hair on reddish yellow ground, becoming broader laterally; the last segments are darker, the black pile upon them being more dense; the sides of the segments usually have blackish spots, overgrown with black pile, in their anterior corners. Venter yellowish rufous; last segment with some blackish hair. Legs: front coxæ clothed with gray pollen, darker towards the tip; a tuft of whitish hairs near the base, on the outside; front femora, distal half of tibiæ and tarsi, dark brown; proximal half of tibiæ yellowish white; middle legs brown, tibiæ more or less yellowish white on the proximal half; hind femora brown, beset with pale hairs; tibiæ yellowish brown, paler at base, and with a fringe of black hair on the outside; tarsi brown. Wings with a distinct brownish tinge; crossveins at the base of the second, third and fifth posterior cells, as well as the bifurcation of the third vein, with distinct brown clouds; first posterior cell closed, the third and fourth veins uniting a short distance before the margin.

I have three female specimens answering this description: two from the Middle States (probably District of Columbia): one from Illinois; unfortunately, only one of them has the markings on the abdomen well preserved. Length, 18-20 mm.

Having thus described the specimens which come nearest to Fabricius's type, I will proceed to notice the aberrant specimens which I have before me, whether they be varieties or species.

I have fourteen females and three males (principally of my own collecting in the District of Columbia; also from Maryland, Pennsylvania, New Jersey), which resemble the above described *T. abdominalis* very much, but have the first posterior cell open, although strongly coarctate. All the females, at the same time, have a distinctly broader front. In other respects, I do not perceive any prominent distinctive characters. The abdominal triangles in these specimens seem to be narrower and more yellowish, the abdomen appears more uniformly rufous, without distinct black spots on the sides, etc., but as, of the typical form, I have only a single specimen with well preserved abdominal markings, I cannot decide whether the differences just stated are permanent or only accidental. The males have subhemispherical heads, with a well marked dividing line between the large and small

facets of the eye; they are more brownish in color, the abdomen especially; each abdominal triangle has a dark spot at its apex, the lateral margins of the segments, anteriorly, are also marked with black, etc. Length, female, 18-22 mm; the average about 20 mm.; male, 20 mm.

Two well preserved females from Kentucky (F. G. Sanborn) are still darker in coloring; the face and pleuræ, with the hairs upon them, are more yellowish; the abdomen is of a bright reddish fulvous; in the middle of the anterior margin of each segment there is a black spot, small on the second, much larger on the following segments, where it is bilobed; the white triangles are replaced by ill-defined yellowish ones, merging into the yellowish hind margin of segments; the sides of the abdomen are almost uniformly reddish fulvous, with no yellow spots and only vestiges of black ones; wings strongly tinged with brown, darker than in the preceding variety; first posterior cell very much coarctate. Length, 21 mm.

I am inclined to think that *T. abdominalis* is a very variable species, and that all these forms are but varieties of the same species. At the same time I acknowledge that the coincidence of a closed first posterior cell with a narrower front, as I find it in three specimens, cannot be easily explained away, without other facts to invalidate its importance.

7. *Tabanus tectus* n. sp.

Female. Face pale yellowish gray, hairs on the cheeks of the same color; palpi reddish brown, closely beset with short, black hair; front yellowish gray, with a brownish shade in the middle, moderately broad; callosity dark brown, or reddish brown, somewhat convex; the line above it elongate spindle-shaped, sometimes forming a distinctly elevated ridge; two first antennal joints black, or nearly so, the third red, annulate portion black; the narrow portion which precedes it is sometimes more or less brownish; upper angle projecting, nearly rectangular. Thorax brownish, with alternating brownish stripes and narrower whitish lines, and clothed with a yellowish gray pollen; pleuræ yellowish gray, slightly reddish in the middle; this reddish region has some black pile upon it; a fringe of black pile before the root of the wings. Abdomen yellowish brown, with a yellowish spot on the first segment, and yellowish white triangles on segments two to five; those on segments two, three and four, in well preserved specimens, are rather large; that on segment five is small and narrow; no trace of white on the following segments; a more or less distinct blackish spot on the apex of one or two of the anterior triangles; hind margins of the segments whitish yellow, with a golden yellow fringe of hairs, expanding laterally; on each side the anterior corners of the segments are more or less darkened; towards the tip the abdomen is nearly brownish and somewhat compressed laterally, so as to become slightly roof-shaped; venter reddish brown, or brownish red; hind margins of segments yellowish, beset with golden yellow hair. Legs brown; front legs darker; all the tibiæ somewhat yellowish white at the base. Wings with a distinct brownish tinge; crossveins at the end of the discal cell, and bifurcation of third vein, distinctly clouded with brown; crossveins at the base of the two last posterior cells also somewhat clouded; first posterior cell distinctly coarctate.

Male. The upper part of the head is much smaller than in *T. abdominalis* (in the variety, at least, with the open posterior cell); hence, the dividing line between the large and small facets lies much higher here, nearly in the middle of the eye, instead of below the

the middle, and the space occupied by the large facets is much smaller. The whitish yellow pollen on the thorax is more dense, concealing the darker longitudinal stripes; the pleuræ have a tuft of brown hair in the middle; the discs of the discal and the posterior cells are more distinctly grayish, less brown, so that in the discal cell a distinct limit is visible between a brownish shadow at the base and along the fourth vein, and the lighter color of the disc; (the females show the same coloring of the discal cell, but much less distinctly). The abdomen is very distinctly roof-shaped towards the tip. Length, 19-20 mm.

Hab. Six females and two males, caught by myself near Doubling Gap, in the Pennsylvania Mountains.

Three females from Dallas, Texas (Boll.) have the abdomen rather less roof-shaped; the white abdominal triangles are a little smaller, narrower, but more pointed, and with a more definite outline; there is a distinct white line in the middle of the sixth segment (of which there is not a vestige in the typical specimens); in other respects, the resemblance between these specimens and those from Pennsylvania is very great, and I leave the question of their specific identity in abeyance. I have seen a smaller specimen from Tennessee (C. V. Riley), and one from Virginia.

T. lectus resembles *T. abdominalis* in general appearance very much; the male, as noticed above, has a smaller head, the abdomen in both sexes differs in its outline, being more narrowed posteriorly; the coloring of the abdomen is more brownish than reddish, the white triangles broader, less yellowish, the first posterior cell a little less coarctate; the frontal callosity usually darker and a little shorter, etc.

6. *Tabanus variegatus*.

Tabanus variegatus Fabricius, Syst. Anth., p. 95, 10; Wiedemann, Dipt. Exot., I. p. 67, 11; Auss. Zw., I. p. 120, 13.

Tabanus fulvifrons Muesquart, Dipt. Exot., 5. Suppl., p. 33, 127 (Macquart has *fulvifrons*, evidently a misprint).

"Lilacino-rubidus: abdomine ballo, albo-maculato: alis fusco-maculatis, margine interno fusco-limbatis."

(*Translation.*) "Antennæ brownish black, root of the third joint reddish yellow; face gray; front cinereous, with a brown, smooth line, and an almost square callosity. Thorax lilac reddish, with five whitish lines, in well preserved specimens with white hairs on the sides, posteriorly. Abdomen chestnut brown, verging into ferruginous brown; the anterior segments on the sides anteriorly with brownish black spots, the fifth and the following almost altogether black; all the incisures, laterally, whitish; the whitish triangular spots in the middle of the segments end anteriorly, on the second and third segments, in a small brown stripe; last segment altogether black. Wings actually of a whitish color (*wirklich von weisslicher Farbe*); costal cell, apex and hind margin pale brownish; crossveins with saturate brown clouds; halteres brown with a whitish knob. Legs brown; base of tibiae ochre-brown. From Fabricius's collection. Length, 9 lines; (19.5 mm.).

"*Hab.* North America."

I translate Wiedemann's description, because he had Fabricius's specimens before him. I possess three specimens from District of Columbia and Maryland, which agree with this description. The middle portion of their wings is whitish, the hind margin has a distinct

brownish border; the thorax is clothed with a dense whitish pollen, which, with the reddish ground color visible through it, produces the appearance which Wiedemann calls lilac reddish (*lilacino-rubidus*; observe that he calls lilac brownish, the thorax of *T. molestus*). These characters easily distinguish well preserved specimens of this species from *T. tectus*; at the same time they are merely differences in coloring, and not plastic characters, and therefore unsatisfactory. The, as yet, unknown male of this species may afford some characters distinguishing it from the very well-marked male of *T. tectus*.

T. sulcifrons Macq. is this species, as the description of the wings proves. The furrow on the front, mentioned by Macquart, is adventitious, and not a specific character.

At the time when Fabricius described this species (1805), there existed a much older *Tabanus variegatus*, that of DeGeer; as the latter, however, is very probably the same as *Chrysops costatus* Fabricius, I do not see any necessity for proposing a new name for *T. variegatus* Fab.

9. *Tabanus molestus*.

Tabanus molestus Say, Journ. Ac. Phil., III, p. 31, 1; Wiedemann, Auss. Zw., I, p. 125, 21.

Female. Palpi reddish, clothed with minute black hairs; face white, with white hairs (in older specimens yellowish); front brownish gray, with a brown spot in the middle; frontal callosity chestnut-brown, a little longer than broad, prolonged upwards as a spindle-shaped line. Antennæ black, with some vestiges of reddish on the first and second joints; sometimes the third joint is reddish at the base; its upper angle more or less projecting. Thorax brown, with well marked white longitudinal lines, formed by short white hairs on a whitish ground color; the reddish scutellum in well preserved specimens appears white from a white pollen and white pubescence. Pleuræ white, with white hairs (yellowish in older specimens); a stripe of black hairs between the root of the wings and the humerus. Abdomen dark brown, often nearly black; on the first segment there is a white spot under the scutellum; hind margins of segments with narrow white borders, expanding into white triangles in the middle; the triangle on the second segment is small, hardly reaching the middle of the segment; those on the third and fourth segments are the largest; those on the fifth and sixth segments are again smaller; the white posterior borders of the segments expand on the sides, so as to occupy the whole lateral margin. Venter densely clothed with a whitish microscopic pubescence; incisures whitish; last segments more brownish. Legs black or brown; tibiæ reddish brown, blackish towards the tip; in well preserved specimens the four posterior tibiæ show a dense, white pubescence. Wings subhyaline, slightly tinged with pale brownish; stigma brown; very faint, hardly apparent vestiges of brown clouds on the crossveins and at the bifurcation of the third vein; first posterior cell not coarctate. Length, 18–20 mm.

Hab. District of Columbia, Kentucky (Bee Spring in June, F. G. Sanborn), Georgia, Missouri. Ten females.

The very large size of the white triangles on the third and fourth abdominal segments, in contrast to the small size of the triangle on the second segment and the white scutellum, helps to distinguish this species from those to which it has a superficial resemblance. The stripes on the eyes of the female are very like those of *T. trimaculatus*.

The identification can hardly be called in doubt, although Say does not expressly mention the triangle on the second segment. Wiedemann must have had an older specimen, as he calls the antennæ and the legs brown and not black. The words "Wurzel und Spitze des dritten Gliedes guttgelb," contain some *lapsus*. Dr. Redtenbacher kindly examined Wiedemann's type in Vienna for me, and his answer to my inquiry satisfied me of the correctness of my identification.

10. *Tabanus trimaculatus*.

Tabanus trimaculatus Pal. Beauvois, Ins. Dipt. Tab. I, f. 5; Wiedemann, Auss. Zw., I, p. 137, 40 (reproduction of Palisot's description); *ibid.*, p. 132, 33 (Wiedemann's own description, doubtfully identified with Palisot's); Macquart, Dipt. Exot. I, 1, p. 142.

Tabanus quinquelineatus Macquart, Hist. Nat. Dipt., I, p. 200, 11.

Female. Palpi whitish yellow, clothed with minute black hairs; face white, with white hairs; front brownish gray, with a brown spot in the middle; frontal callosity reddish brown, seldom dark brown, somewhat longer than broad, with a more or less spindle-shaped prolongation above. Antennæ black, sometimes a little reddish on the first joint; upper angle of the third joint sharp, projecting, but not drawn out in a point. Thorax brown, with well marked white longitudinal lines, formed by short white hairs on a whitish ground color; scutellum clothed with a whitish pollen and pubescence, through which the brownish ground color is visible. Pleuræ white, with white hairs; a stripe of black hairs between the root of the wings and the humerus. Abdomen deep black or brown opaque; on each of the segments three-five a white triangle in the middle; lateral margins of all segments white; (in some specimens the second segment has two very faint whitish dots in the middle, and at a considerable distance from each other). Venter with a broad brown longitudinal stripe in the middle; its sides whitish. Legs: femora black or brown, clothed with a white pubescence; tibiæ yellowish white, black at tip; tarsi black. Wings subhyaline, slightly tinged with pale brownish; stigma brown; faint brownish clouds on the crossveins and on the bifurcation of the third vein; first posterior cell slightly coarctate at the end, in some specimens more than in others. Length, 17-19 mm.

Male. Head subhemispherical, with a distinct demarcation between the large and small facets; in the dry specimen the region occupied by the large facets is whitish, with a broad brown crossband over both eyes; (in this respect very like the male of *T. coffeatus*). Length, 17 mm.

Hab. District of Columbia, Delaware, Pennsylvania, Mississippi, Illinois, Georgia (Ent. Soc. Phil.); Carolina (Macq.). Ten females and one male.

The eyes of the female show two parallel, rather narrow green bands, on purple ground; the interval between them is twice as broad as the bands themselves, and almost equally broad at both ends; (colors revived on moist sand).

Except in the coloring of abdomen and legs, this species has a most striking resemblance to *T. molestus*; (hence Wiedemann, l. c., compares both species). A very characteristic mark of the species (besides the three triangles or segments three-five), and the absence of them on the first and second segments, is the broad brown longitudinal stripe on the venter. The scutellum is less white here than in *T. molestus*, and does not much differ in coloring from the rest of the thorax. The average length of *T. trimaculatus* is smaller than that of *T. molestus*.

The synonymy of Macquart's *T. quinquelineatus* I consider as certain. The description of the venter is especially convincing: ("ventre à large bande noire longitudinale").

11. *Tabanus tener* n. sp.

Female. Palpi pale red-lish, clothed with whitish pollen and white and black hairs; face white, yellowish around the antennae, with white hairs on the cheeks; front grayish, brown in the middle, yellowish gray above the antennae; frontal callosity reddish brown, a little longer than broad, with a linear prolongation above; prevailing color of the antennae black, the vestiges of reddish on the first two joints are almost concealed under black hairs; base of the third joint more or less, sometimes hardly perceptibly, reddish; upper angle of this joint well-marked, but not very sharp. Thorax lilac-reddish, with the usual white lines formed by a grayish pollen; the pale reddish ground color of the pleurae is almost concealed under a whitish pollen and white hairs; a fringe of brown hairs from the humerus backwards; a small tuft of blackish hairs in front of the scutellum. Abdomen of the same color as the thorax, which color is softened by a thin layer of whitish pollen; the segments have large but faint and easily rubbed off triangles in the middle, formed by a short white pubescence on whitish ground; lateral margins also whitish. Venter of the same color as the abdomen, with the same thin covering of whitish pollen and whitish incisures. Front legs dark brown, proximal half of the tibiae lighter brown; four posterior legs reddish brown, with whitish hairs. Wings subhyaline; very faint, almost obsolete, brownish clouds on the bifurcation of the third vein and at the base of the second posterior cell; stigma brown; first posterior cell not coarctate. Length, 17-18 mm.

Hab. Georgia (J. Ridings); Indian River, Florida (E. Palmer). Four females.

This species is difficult to describe from the want of any well-marked characters. It is distinguished by a peculiar soft reddish brown coloring, and the faintness of the white abdominal triangles, which are very easily rubbed off. The comparatively small thorax and somewhat narrow abdomen make its shape appear more elongated than that of the other species of the same group. The evanescent spots at the base of the bifurcation of the third vein and of the second posterior cell will also facilitate its recognition.

The eyes (softened on moist sand) showed two faint greenish crossbands, converging at the outer end. For some time I thought that this might be *T. gracilis* Wied.; but Wiedemann gives the size as five and two-thirds Rhénish lines, while it should be eight and one-half in order to render the identification possible.

12. *Tabanus melanocerus*.

Tabanus melanocerus Wiedemann, Auss. Zw. I, p. 122, 16.

? *Tabanus crestinus* Linné, Syst. Nat., II, p. 1900, 8; DeGeer, VI, p. 229, 8; Tab., XXX, f. 5; Fabricius, Ent. Syst., IV, p. 365, 13; Syst. Anth., p. 96, 12.

Female. Palpi whitish, clothed with minute black hairs; face white, with white hairs; front brownish, mixed with gray; frontal callosity reddish brown, sometimes dark brown, longer than broad, with a linear prolongation above; antennae black, more or less reddish at the basis of the third joint; this joint is broad, its upper angle projecting. Thorax gray, with whitish longitudinal lines; (the color of the thoracic dorsum and scutellum in somewhat worn specimens shows traces of reddish; but in a very fresh and well-preserved spec-

men from Florida, it is of a dull cinereous, with whitish lines; its surface is clothed with short black hairs, especially apparent at the base of the scutellum. Pleura grayish white, with white hairs; a fringe of black hair between the humerus and the root of the wings. Abdomen black or dark brown; the hind margins of the segments have white borders, expanding into large white triangles in the middle, and becoming broader towards the lateral margins; segments six and seven show but vestiges of white. Venter brown, or reddish brown, more whitish on the sides; hind margins of segments white. Legs: femora black or brown, the four posterior ones with whitish hairs; tibiae yellowish white, blackish at tip; distal half of front tibiae black. Wings grayish subhyaline; stigma brown, its environs sometimes faintly tinged with brownish; first posterior cell considerably coarctate at the tip, sometimes nearly closed. Length, 17-19 mm.

Hab. Mississippi, Alabama, Georgia (J. Ridings); Cedar Keys, Florida (June 4, E. Schwarz); Kentucky (Wied.). Five females.

The identification of Wiedemann's description cannot be doubtful, as the coarctate posterior cell easily helps to recognize this species. There is a superficial resemblance between *T. melanocerus* and *T. molestus*, but they are easily distinguished by the size of the triangle on the second abdominal segment, which is nearly of the same size as on the third segment in *melanocerus*, but two or three times smaller in *molestus*. *T. melanocerus*, like *T. coffeatus*, has no crossbands on the eyes.

I have seen this species in some European collections under the name of *T. crastans* Linn., the original type of which, figured in DeGeer, was from Surinam. There is nothing in the descriptions of Linné, DeGeer¹ and Fabricius, to prevent this identification. At the same time, in view of the shortness of these descriptions and of the difference in the locality, it will be safer to retain Wiedemann's name, the identification of which cannot in the least be doubtful. Wiedemann quotes *T. crastans* among the species he had not seen.

13. *Tabanus coffeatus*.

Tabanus coffeatus Macquart, 2. Suppl., p. 23, 109; *male*.

? *Tabanus nigripes* Wiedemann, *Ans. Zw.*, I., p. 112, 59; *male*.

Female. Palpi yellowish white, clothed on their distal half with minute black hairs; face white, with white hairs; front dark grayish mixed with blackish brown; frontal callosity reddish brown or dark brown, but little longer than broad, with a linear prolongation above; subcallus often denuded; antennæ black, a vestige of reddish at the base of the third joint; this joint rather broad, its upper angle obtuse. Thorax gray, with whitish longitudinal lines; (well preserved specimens show a broad stripe of gray pollen, more dense on each side, and with a fine longitudinal line in the middle). Pleura grayish white, with white hairs mixed with a few black ones; a fringe of black laid between the humerus and the root of the wings. Abdomen brownish black; the hind margins of the segments have white borders expanding into large white triangles in the middle, and becoming broader towards the lateral margins; segments six and seven show but vestiges of white. Venter brownish black, hind margins of the segments white. Legs black; tibiae more or

¹DeGeer's figure shows broad abdominal crossbands and confusion with *T. melanocerus*, no triangles, which, if correct, would be against the identifi-

less brownish at base; the legs are clothed with whitish hairs, especially on the tibiæ; but they appear to have that color in a certain light only. Wings grayish subhyaline; stigma brown; first posterior cell not coarctate. Length, 13–14 mm.

As the description shows, this species very much resembles *T. melanocerus*; it differs principally in its smaller size, the much darker coloring of the tibiæ, and especially in the first posterior cell not being coarctate at all. The eyes in this species, as in the preceding, are uniformly colored in life, and not banded.

Male. Altogether brownish; thorax with a broad stripe of grayish pollen anteriorly, which is darker in the middle (thus producing the appearance of two stripes, separated by a dark interval); abdomen with rather narrow whitish gray posterior borders on the segments, expanded into small triangles in the middle; on the venter the same whitish hind borders of the segments; pleuræ clothed with blackish hair; legs dark brown, tibiæ faintly reddish. Wings nearly hyaline, stigma brownish; sometimes a faint brownish cloud behind it. Head large; subhemispherical; in dry specimens the lower, small facets are black, the upper ones have a broad brown crossband on whitish ground. Antennæ brown, third joint reddish at the base; face brownish gray, beset with black hairs; palpi black; subcallus brown (denuded in both of my specimens). Length, 13–14 mm.

Hab. District of Columbia; Delaware; New York; Florida (Waldo, Fla., 2d June, 1875. Messrs. Hubbard and Schwarz); one of the males is from Massachusetts. Ten females; two males.

I little doubt that the above described male and female belong to the same species, and on this assumption I adopt the name *coffeatus*, as Macquart describes the male only. The identification of his description seems certain to me. The words “partie antérieure du front à callosité brune,” are particularly convincing. It is not usual to speak of the callosity in describing a male specimen; but in the present species the *subcallus* in both sexes is often denuded, and for this reason attracted Macquart's attention. This circumstance would also serve to confirm, if any confirmation were needed, the specific identity of the two sexes.

Wiedemann's description of *T. nigripes* (he also had a male specimen) agrees very well with the male of *T. coffeatus*, only the size (7 German lines = about 15.3 mm.) is a little too large. Between the two descriptions I preferred the one which I considered the more certain.

14. *Tabanus Orion* n. sp.

Female. Palpi dark brownish red, clothed with short black hairs; face yellowish white, with yellowish white hairs; front whitish yellow above the antennæ; brownish, mixed with yellowish and grayish above the frontal callosity; the latter longer than broad, attenuated above and gradually merging in the linear prolongation; its color, in all my specimens, is brownish red. Antennæ reddish; first joint with some black hairs above; third joint, red at the base only, otherwise black; upper corner well marked. Thorax reddish brown, clothed with a whitish pollen, forming more or less distinct whitish lines (the appearance of the thoracic dorsum is very variable in this species, according to the degree of preservation, or perhaps also to the age of the specimen at the time of its death; in well preserved spec-

imens I perceive a short, black pubescence, covering the whole dorsum). Pleuræ brown, clothed with dense whitish pollen and white hairs; a fringe of black hairs back of the humerus. Abdomen brown, with a comparatively small triangular or subtriangular white spot in the middle of the hind margins of each segment; lateral margins of the segments whitish. Venter brown, with a whitish pollen on the sides, leaving a more or less distinct broad, brown longitudinal stripe in the middle. Legs almost uniformly reddish brown, tips of front tibiæ and the tarsi but little darker. Wings unicolorous, very distinctly tinged with pale brownish; first posterior cell broadly open. Length, 23–25 mm.

Male. I have a single specimen, which, I have no doubt, belongs to this species. The face is brownish gray; the body more uniformly brown. The head is large, but less sub-hemispherical than in *T. abdominalis*, *coffeatus* and *trimaculatus*; the division of the large and small facets is well marked; the eyes, in the dry specimen, are altogether unicolorous. Length, 20–21 mm.

Hab. Canada (Bélanger, Couper, Provancher); Nahant, Mass. (Prof. L. Agassiz); Suffield, Conn. (G. Dimmock); Beverly, Mass. (E. Burgess). The male specimen is from the State of New York. I have eight females and one male.

This species will be easily distinguished from *T. Actæon* by its large size, the coloring of the abdomen, the non-coarctate first posterior cell, etc.; but most easily by the coloring of the front tibiæ, which in *T. Actæon* are almost whitish yellow at the base, and much darker towards the tip. The eyes of *T. Orion* ♀, seem to be unicolorous; at least softening on wet sand did not bring out any stripes on them.

15. *Tabanus Actæon* n. sp.

Female. Palpi brownish red, densely clothed with short black hairs; face whitish, with white hairs; front grayish, mixed with brownish in the middle; in well preserved specimens with some short blackish hairs on the vertex; frontal callosity dark brown (in one of the specimens brownish red), tapering off into a linear prolongation. Antennæ reddish, with black hairs on the basal joints; third joint reddish at base, the remainder dark brown and black; its upper angle sharp, projecting; the narrow portion of the third joint is rather elongate. Ground color of thorax reddish brown; nevertheless the prevailing color of the dorsum is black, in consequence of four black, nearly coalescent stripes, the two middle ones not reaching the scutellum; these black stripes, in well preserved specimens, are separated by lines of gray pollen. Pleuræ grayish white. Abdomen brownish red or reddish brown; a comparatively small white triangle in the middle of the hind border of each segment, surmounted by a dark spot, which connects it with the edge of the preceding segment; incisures and lateral margins of segments whitish. Venter clothed with a dense whitish pollen, and with a broad brown longitudinal stripe in the middle. Femora brownish, with whitish pollen and whitish hairs; front and middle tibiæ whitish yellow, brown towards the tip; the hind tibiæ brownish yellow or yellowish brown. Wings unicolorous, with a uniform, pale brownish tinge; first posterior cell very slightly attenuated. Length, 19–21 mm.

Hab. Massachusetts; Connecticut; Minnesota; Wisconsin; Canada. Seven female specimens. The eyes of this species seem to be unicolorous.

16. *Tabanus cymatophorus* n. sp.

Female. Face whitish, with white hairs on the cheeks; palpi brown, densely clothed with black hairs; front grayish, with a yellowish tinge immediately above the antennae, and a brownish one above the callosity; the latter suboval, dark brown, prolonged in a line above; vertex gray; antennae reddish brown, third joint dark brown towards the end. Thoracic dorsum grayish, with four broad blackish stripes separated by grayish lines; sides of the dorsum gray, separated from the pleurae by a fringe of blackish hairs; tufts of longer white hairs between the root of the wings and the scutellum; a small brown triangle above the scutellum, which is yellowish gray, with minute white hairs; pleurae and pectus white, with white hairs. Knob of halteres brown, whitish at tip. First abdominal segment white, with brownish indistinct spots at the base; segments two-four brown at base, which color expands into triangles on each side and into two diverging lobes in the middle; the posterior half of these segments is white, expanding into triangles, which fill out the intervals between the brown color; segments five and six show the same markings, only less distinctly. Venter brownish, on each side thinly clothed with whitish pollen, which thus leaves a broad brownish longitudinal stripe in the middle; hind margins of segments whitish. Legs black, base of tibiae white, which color occupies more than half of the tibia on the intermediate pair, and less than half on the two other pairs. Wings subhyaline; dark brown clouds on crossveins, at the base of all posterior cells, and on the bifurcation of third vein; stigma yellowish brown, rather pale; first posterior cell coarctate at its distal end. Length, 20 mm.

Hab. Kentucky, near Mammoth Cave (F. G. Sanborn). A single, but very well preserved specimen.

This species is not unlike *T. Reinwardtii* Wied. in its general appearance and coloring, but is much larger, the palpi are darker, the frontal callosity more elongated, the coloring of the legs altogether different, the white design on the abdomen much better defined, especially the middle triangles, which are larger, and connected posteriorly with the lateral ones by a broad white border, etc.

17. *Tabanus venustus* n. sp.

Female. Face yellowish white; palpi brownish, clothed with minute black hairs; front grayish yellow above the antennae, grayish brown above the callosity, and with a pair of dark brown spots in the middle; callosity brown, not occupying the whole breadth of the front, its linear prolongation not distinctly connected with it. Thorax brown, with longitudinal white lines; scutellum clothed with whitish pollen. Abdomen brown, with white triangles in the middle of the segments; they are especially large on the second, third and fourth segments; segments three-six, on each side of the triangle, show a white spot. Venter brownish, with whitish pollen, which leaves a broad brown longitudinal stripe in the middle. Feet brown. Wings variegated with brown, as follows: the root hyaline; immediately beyond the humeral crossvein a broad brown crossband, reaching the posterior margin; another narrower and shorter crossband covering the crossveins at the base of the marginal, first posterior and discal cells, is almost confluent with the first; the whole posterior margin is bordered with pale brown, which border, being continued around the apex to the anterior

margin, expands into a large spot, coalescing with brown clouds at the origin of the fork of the third vein and at the end of the discal cell; first posterior cell distinctly attenuated.

Male. Surroundings of the mouth and palpi clothed with blackish hair; spots on the abdomen replaced by broad whitish crossbands, especially on segments two to four; in other respects like the female. Length, 14-15 mm.

Hab. Dallas, Texas (Mr. Boll). A male and a female. Missouri, in July (C. V. Riley).

The variegated wings of *T. venustus* being unique among the North American species, will render it easily recognizable. The head of the male is comparatively small, not larger than that of the female; the large facets occupy their usual place, but the difference in size between them and the small ones is so small that it requires a close attention to discover it.

18. *Tabanus psammophilus* n. sp.

Female. Palpi short and stout, pale yellowish white; face white, with white hairs; front gray, remarkably broad, somewhat convergent anteriorly; callosity black, broader than long, without any linear prolongation above; antennæ pale reddish yellow; third joint tinged with brownish; its annulate portion black; in shape the third joint is comparatively narrow, and not excised at all above, so that its upper angle is very little marked. Ground color of the body dark, but almost entirely concealed under a white pubescence. Legs yellowish, tips of tibiæ and tarsi brownish. Wings whitish, with brown veins; a long stump of a vein near the origin of the upper branch of the third vein; first posterior cell not coarctate.

Male. Similar to the female, except in the sexual characters. Length rather variable, from 11 to 15 mm.

Hab. Ft. Capron, Florida, April 10, 1875 (Messrs. Hubbard and Schwarz), on the sea beach; four males and three females.

The uniformly whitish coloring of this species, the broad front, the transverse frontal callosity, the long stump of a vein on the fork, etc., render the species very easily recognizable. I suppose that it is uniformly white in life; most of the specimens before me seem to have somewhat suffered from moisture, and have for this reason a darker coloring.

In the male the difference between the large and small facets on the eyes is very marked, the latter occupy a comparatively small space on the underside, and are but little prolonged along the posterior orbit. On the eyes of the female I perceive two approximate, bluish stripes on green ground, the upper and lower portion of the eye being again dark blue (or, in other words, the ground color is blue, with two broad green stripes, the broad interval between which contains a third, much narrower green stripe).

Tabanus nanus Macquart, Dipt. Exot. Suppl., I. p. 42, from Texas, reminds one of the present species; but the size given (four lines) is by far too small for identification. At any rate the name *nanus* cannot be used, being preoccupied by Wiedemann for a species from the Cape.

19. *Tabanus nivosus* n. sp.

Female. Front of moderate breadth, parallel, brownish gray, with brown shadows; frontal callus pale brown, with a stout linear prolongation above; face white, beset with white

down: palpi rather stout at the base of the second joint, yellowish white, beset with blackish hairs at the tip. Antennae: first joint reddish yellow, with a tuft of black hair on the upper end; third joint black, yellowish at the extreme base only; excision shallow, and hence, upper angle but little projecting; basal portion rather broad; annulate portion short, stout. Thoracic dorsum dark brown, with faint whitish longitudinal lines; the sides, including the humeri, reddish; beset with sparse golden yellow and whitish hairs; scutellum dark brown, beset with the same hairs. Pleurae yellowish, with long, soft, white hairs. Abdomen whitish pollinose, beset with a short, white pubescence; in the middle of each segment a bilobed (or truncate-obcordate) brownish black spot, the largest on the second segment, and diminishing in size on each successive segment; the sides of the segments (except the first) are brownish, this brown border gaining in breadth towards the end of the abdomen. In badly preserved specimens the reddish ground color of the white portions of the abdomen appears. Venter grayish. Front legs brown, except the proximal two thirds of the tibiae, which are whitish yellow; four posterior legs reddish yellow; femora and tips of tarsal joints brownish; tips of tibiae very slightly infuscated; all the coxae and femora clothed with soft hairs; tibiae with short, whitish pile; the hind tibiae have a fringe of hair, which, in a certain light, appears whitish. Wings almost hyaline; stigma pale brown; the bifurcation and some of the crossveins have brown shadows, visible under the magnifying glass only; first posterior cell not attenuated.

Male. The white coloring of the abdomen, interrupted only by the middle row of bilobed blackish spots, is very striking in my only specimen: the face, and the hairs upon it, are brownish gray (not white, as in the female); the legs are somewhat darker; the white lines on the thorax are not visible. Head larger than that of the female, although not subhemispherical; on the eyes there is a yellowish border above the line of separation, between the larger and the smaller facets. Length about 13 mm.

Hab. New Jersey; one male and two females (communicated by the American Entomological Society).

The coloring of the eyes (revived by moisture) in the female proved to be green, with a faint vestige of a single purple crossband.

20. *Tabanus vivax* n. sp.

(?) *Tabanus marginalis* Wiedemann, Auss. Zw., I, p. 166, 81.

Male. Face gray, with whitish hairs below, and blackish ones on the sides; second joint of palpi reddish, with a gray pollen and with whitish and blackish hairs; frontal triangle (above the antennae) gray, black or brown at the tip; antennae: basal joints reddish yellow, with black hairs, third joint black, reddish yellow at the extreme base only, elongate, of moderate breadth, but little excised above, the upper angle moderately projecting. Thorax grayish black, with white longitudinal lines, abbreviated posteriorly; pleurae and pectus grayish, clothed with long whitish hairs. Abdomen black; on the first segment a small white spot under the scutellum; on each of the following segments a triangular white spot on the hind margin, and an oblique lateral white spot on each side, angular in shape (owing to its being prolonged along the hind margin); on the second segment these lateral spots are distinctly larger than the triangle in the middle; they become smaller on the

third and fourth segments. Venter blackish, clothed with a white pollen, and with whitish incisures. Legs black, beset with whitish hairs; tibiæ more or less reddish at base. Wings hyaline, stigma brown; first posterior cell open. Length, 14 mm.

The description was drawn from a very well preserved specimen which I took at Trenton Falls, in July, 1874. I have another, less well preserved specimen, from Maine. I also refer to this species a female, from a doubtful locality (Massachusetts?) too much faded, however, to make it worth while to describe it.

The shape of the head of the described male specimens is very like that of *T. nivosus*, it is rather large, but not subhemispherical; there is a very well marked division between the large and the small facets. In size and shape the males of these two species are very much alike, but are easily distinguished by the prevalence of the whitish color on the abdomen of the one, and of the black on the abdomen of the other.

I introduce this imperfectly described species only to draw the attention of collectors to these closely related species, which, in outward appearance, bear also much resemblance to *T. astutus* and *T. microcephalus* of the group with pubescent eyes and small-headed males. (Compare the observation at the end of the description of *T. astutus*.)

Wiedemann's description of *T. marginalis* (female) applies better to the present species than to any other, proper allowance being made for the difference of sex. Nevertheless, the identification is very doubtful; nor is it certain whether Wiedemann and Fabricius, whom he quotes, described the same species.

21. *Tabanus longus* n. sp. *See Supp. IV*

Female. Front moderately broad, brownish cinereous, with blackish hair; callosity square, black, rather convex; above it, ~~and connected with it,~~ an indefinite, elongate, blackish and somewhat shining spot; antennæ: two basal joints reddish, clothed with blackish hair; third joint variable in coloring, either blackish, with the base alone reddish, or reddish, with the annulate portion black; the body of the joint is of moderate breadth, with a well marked, ~~although obtuse,~~ upper angle; face white, with white down; palpi rather stout, yellowish white, with small black hairs. Thorax grayish black, with very faintly marked gray lines; sides of the dorsum often reddish; pleuræ and pectus grayish white. Abdomen rather long and comparatively narrow (the sixth segment longer than in the allied species, but little shorter than the preceding one), grayish ^{brown} ~~black, some-~~ ~~times reddish on the sides, near the base;~~ on segments one to six on each side a row of well marked, oval, oblique, whitish spots, usually (but not always) not coalescent with the whitish hind margins of the segments; in the middle of the abdomen a faint, whitish, longitudinal line, expanded at the incisures, thus forming a series of faint triangles, with a rather broad basis, but a very narrow, linear apex. Venter light gray, clothed with minute white hairs; the sides are sometimes reddish. Legs reddish brown, clothed with a grayish pollen; tarsi brown, the basis of the four posterior tarsi paler. Wings grayish hyaline; ~~costal cell pale yellowish brown;~~ stigma pale brown; first posterior cell broadly open. Length, 12-14 mm.

Hab. Middle States (Mus. Comp. Zool. and Am. Ent. Soc.). Four female specimens. A fifth specimen is larger, and has the front distinctly coarctate anteriorly.

This species is distinguished by its slender form and elongated abdomen. Species closely ~~competing in length~~ ^{resembling} seem, however, to exist in the South, which, in some cases, may render its recognition doubtful.

I have seen a specimen from Florida (Ft. Capron, March 26; Messrs. Hubbard and Schwarz) only 11 millim. long, of a purer, almost whitish gray; markings of the abdomen very distinct; oblique spots on second segment in contact with the hind margin, those of the third nearly so; costal cell subhyaline; front rather broad, etc. It seems to be a different species.

Two specimens from Texas (Waco, Belfrage, in Mr. Burgess's collection) are more reddish in color; there is a faint brownish cloud on the bifurcation of the third vein, etc. They also seem to belong to a different species.

22. *Tabanus pumilus*.

Tabanus pumilus Macquart, Dipt. Exot., I, 1, p. 146, 51.

Female. Palpi stout, whitish, with some black hairs; face grayish white; front brownish gray, convergent anteriorly; callosity brownish or black. Antennæ reddish; third joint remarkably broad and comparatively short: its annulate portion short and stout, sometimes infuscated. Thorax blackish gray, with white lines, sometimes reddish on the sides. Abdomen blackish, segments with white hind margins, expanding into small triangles in the middle (often obsolete); on each side of these triangles oblique oval white spots, not coalescent with the hind margins; the sides of the abdomen often appear reddish (especially when denuded). Legs pale reddish yellow, clothed with whitish pollen and white hairs; tips of tibiae brown; tarsi brown, base of the four posterior ones paler. Wings hyaline; stigma pale brown; first posterior cell broadly open. Length, $8\frac{1}{2}$ –10 mm.

Male. Head very large and broad; division between the large and small facets very marked. Third antennal joint less broad; its annulate portion more drawn out in a point. Abdomen reddish brown, the intermediate, triangular white spots almost obsolete, etc. (As I have only a single, somewhat damaged specimen, I refrain from a more detailed description.) Length, 10 mm.

Hab. Middle and Southern States (Maryland; West Point, N. Y.; Enterprise, Fla., May 11–13, by Messrs. Hubbard and Schwarz). Seven females and one male.

T. pumilus will be very easily distinguished by its small size, the peculiar broad shape of the third antennal joint, the convergent front of the female, etc.

Macquart says: "deuxième cellule sous-marginale ordinairement appendiculée." Two of my specimens indeed show a vestige of a stump; but this seems to be an exceptional case.

23. *Tabanus lineola*.

Tabanus lineola Fabricius, Entom. Syst., IV, p. 369, 33; Syst. Anth., p. 102, 41.—Coquebert, Illustr. Icon., p. 112, Tab., XXV, f. 6.—Wiedemann, Dipt. Exot., I, p. 81, 36; Auss. Zw., I, p. 170, 89.—Harris, Ins. N. Engl., 3d edit., p. 602, fig. 262.—Palisot-Beauvois, Dipt., Tab. II (somewhat doubtful).

Tabanus simulans Walker, List., etc., I, p. 182. Nova Scotia.

? *Tabanus scutellaris* Walker, Dipt. Saundersiana, p. 27.

Female. Palpi rather stout at the base, yellowish white, beset with short black hairs; face white, with white hairs; subcallus grayish yellow; front dark yellowish gray, distinctly

narrowed anteriorly; callosity black, nearly square, with a short linear, sometimes spindle-shaped prolongation above. Antennæ brownish red, annulate portion black; upper angle of third joint well marked. Thorax grayish black, with white lines; in well preserved specimens these lines, as well as the sides of the scutellum, are beset with a short, yellowish pubescence; the scutellum is often, but not always, reddish at the tip, which appears only in denuded specimens; humeral callosity reddish; pleura whitish gray. Abdomen brownish black, with a longitudinal, very well marked, whitish or yellowish stripe along the middle, ending at the hind margin of the sixth segment; this stripe is formed by a grayish pollen as ground color, which is beset with a yellowish pubescence; two lateral stripes of the same color, subconvergent at both ends, are formed by a series of oblique spots on the segments. Venter whitish, being clothed with a dense whitish pollen and a whitish pubescence (in some well-preserved specimens the venter is reddish yellow, beset with yellowish hairs; last segment black, beset with black hair); a dark, ill-defined, longitudinal stripe is sometimes visible. Legs: femora dark, paler towards the tip (in some cases pale yellow, except at base), beset with gray pollen and white hairs; tibiae pale yellow, the front pair black on its latter half; front tarsi black, the four posterior ones brown, yellowish at base. Wings hyaline, stigma pale brownish; costal cell nearly hyaline; first posterior cell sometimes broadly open, in other cases gently attenuated.

Male. Head not very different in size and outlines from that of the female; line of division between the large and small facets distinct; thoracic and abdominal stripes less well marked. Length, 12-14 mm.

Hab. North America, including Mexico; this is one of the most common species in the United States; occurs abundantly in the States along the Atlantic Coast, also in Florida, Texas, Iowa, etc.

The shape of the front, attenuated anteriorly, the hyaline costal cell and the sometimes reddish scutellum, will help to recognize this species in all its varieties. It varies both in size and coloring; the dorsal stripe has sometimes perfectly even edges, sometimes it is jagged, being expanded at every incisure; the same is the case with the lateral stripes. I have already alluded to the striking differences in the coloring of the venter. The eyes of the female are banded, the upper band being interrupted before reaching the outer margin of the eye.

The identification of Fabricius's short description is rendered certain by Coquebert's figures, which he quotes in the *Systema Antliatorum*.

The mention of the end of the scutellum being reddish in Walker's description of *T. scutellaris*, renders its synonymy with *lineola* very probable; I do not understand, however, the description of the gray abdominal middle stripe, "which ceases on the tawny hind borders of each segment."

The synonymy of *T. simulans* I look upon as certain.

24. *Tabanus nigrovittatus*.

Tabanus nigrovittatus Macquart, Dipt. Exot., 2^e Suppl., p. 24, 111.

Female. Face whitish, palpi pale yellowish white, with some minute, scattered, black hairs; front parallel, yellowish-gray; frontal callosity dark brown or black, a short, spindle-shaped blackish line above it, and usually disconnected from it; antennæ reddish, annulate

portion rather long, black (in some specimens the third joint is brownish). Thorax blackish-gray, with a pale yellowish pubescence and scattered black, erect pile; no whitish lines, but a hardly perceptible vestige of a broad, longitudinal stripe of purer gray in the middle. Pleurae dull yellowish gray. Abdomen with a whitish longitudinal stripe, running from the scutellum to the end of the sixth segment; it is enclosed between two blackish stripes running beside it; on each side of the blackish stripe there is again a very faint whitish one, usually visible on segments four to six only; base of the first segment blackish, but sides of segments one to three reddish. Venter reddish at base, with more or less black in the middle in the shape of a stripe, blackish towards the tip. Femora black, clothed with grayish pollen, the tips pale reddish; front tibiae black, reddish brown on their proximal half; front tarsi black; four posterior tibiae reddish, except the tip, which is infuscated (more so on the hind than on the middle pair); tarsi brown. Wings hyaline, costal cell yellowish, stigma yellowish. Length, 9–11 mm.

Male. Like the female, but the thorax somewhat darker, the yellowish pubescence being less apparent, and the black erect pile more so and longer; face more grayish; the head, in size and outline, not very different from that of the female. Length, 10 mm.

Hab. Massachusetts, Rhode Island, New York, New Jersey, especially near the sea-coast; (Cambridge, Mass., June 28–July 15, P. R. Uhler and O. Sacken; Salisbury Beach, Aug. 25, in numbers, B. P. Mamm). I have sixteen females and ten males. The eyes are like those of *T. costalis*, light green, with a single purple crossband in the middle; it seems to me that this band is somewhat narrower here.

This species has some resemblance to *T. costalis* Wied., but is much smaller, and less yellow on the thorax; face and palpi also less yellowish; the black abdominal stripes enclosing the whitish ones are less dark; the white stripe between them is much less distinctly marked than in *T. costalis*; the hind tibiae are only slightly brownish here at the tip, while in *T. costalis* the tip is very distinctly and rather abruptly black.

The males, especially, are easily told apart, the thorax of *T. nigrovittatus* ♂, being blackish, that of *T. costalis* very distinctly yellow; in *T. nigrovittatus* ♂, there is, on each side of segments one to three of the abdomen, an oval rufous spot, leaving a well defined, broad, blackish stripe in the middle, in the middle of which the white stripe is running; in *T. costalis* ♂, the extent of the rufous on the abdomen is much more variable, and hence the black stripe in the middle less constant and well defined. From *T. lincola* the present species differs in the smaller size, parallel front, less pure whitish, more yellowish white face, the yellowish tinge of the costal cell, etc.

I see no objection against identifying this species with Macquart's description, except the "une tache testacée en avant des ailes et sur les côtés du bord postérieur," which I perceive only in the male, while Macquart describes the female. Before identifying this species with Macquart's I distributed specimens to several correspondents under the name of *T. pauper*.

25. *Tabanus costalis*.

Tabanus costalis Wiedemann, Anss. Zw., I, p. 173, 94; (?) Bellardi, Saggio, etc., I, p. 63.

Tabanus ricarius Walker, List, etc., I, p. 137; *female*.

(?) *Tabanus baltimorensis* Macquart, Dipt. Exot., 5^e Suppl., p. 34, 129.

Female. Face yellowish white, palpi yellow, with short and rather dense black hairs; second joint rather stout at base; front grayish yellow, very slightly narrower anteriorly,

nearly parallel; callosity black, with an indistinct prolongation above; antennæ reddish, annulate portion of the third joint black, nearly as long as the body of the joint; the latter somewhat broad, with a distinctly projecting upper angle. Thorax grayish yellow (a gray ground color being clothed with golden yellow hairs). Abdomen with a conspicuous longitudinal yellowish white stripe in the middle, somewhat expanded at each incisure, and two lateral stripes, very much attenuated posteriorly, and formed of a series of oblique, almost coalescent spots, one on each segment; the intervals between the central and the lateral stripes are black (which color thus forms two distinct, well marked, nearly parallel stripes, enclosing on both sides the central pale stripe); the two lateral stripes are bordered on the outside by a second pair of more or less distinct black stripes, formed by a series of black oblique spots, one on each segment; when these spots are less distinct, the lateral pale stripes almost coalesce with the reddish yellow lateral margins of the abdomen; on segments five and six the black prevails, but in well preserved specimens both central and lateral stripes are still visible. All the pale colored portions of the abdomen show, under the magnifying glass, a dense covering of golden hairs. Venter reddish yellow, mixed with blackish, especially towards the tip, both colors being softened by a dense covering of yellowish hairs. Legs black; front tibiæ yellowish at base, four posterior tibiæ yellow, except the tip, which is black; femora clothed with a dense yellowish gray pollen. Wings grayish hyaline; costal cell with a distinct brownish yellow tinge; first posterior cell broadly open.

Male. The black abdominal stripes are usually less dark, and hence, less well defined; especially the base and sides of the abdomen are usually more reddish. Length, 10–13 mm.

Hab. A common species in the Middle and Western States; according to Bellardi, also in Mexico.

I have seen specimens from Florida (Lake Harney, May 5; Messrs. Hubbard and Schwarz), very small (9–10 mm.), and very like *T. nigrovittatus* in appearance; nevertheless I would rather refer them to *T. costalis*. One of them had the third antennal joint entirely black.

The eyes of the female are light green, with a single purple crossband in the middle.

I accept the traditional and very probable interpretation of Wiedemann's description of the male, although, taken literally, it would render the identification doubtful. I am not sure about the interpretation of Mr. Bellardi's description.

T. vicarius Walker is most probably this species; perhaps also *T. baltimorensis* Macq.

26. *Tabanus fulvulus*.

Tabanus fulvulus Wiedemann, Auss. Zw., I, p. 153, 66.

Male and female. Front and vertex clothed with grayish fulvous pollen; callosity (±) nearly square, brownish or blackish; above it, but not connected with it, is a short, stout, smooth line of the same color; face and cheeks whitish (see the observation at the end); palpi (±) rather stout, pale yellowish white, with blackish hairs; in the male they are whitish; antennæ: first joint reddish yellow, with black hair; third joint red: its upper angle well marked and projecting, its annulate portion black or brown, much shorter than the remaining portion of the joint; (in my only male specimen the third joint is altogether red, perhaps not fully colored). Thorax and scutellum yellowish fulvous above, with golden hairs, mixed with black ones (in coloring and appearance the thorax resembles

that of *T. costalis*). Pleurae and pectus grayish. Abdomen with yellow longitudinal line, expanding on the hind border of each segment, and thus forming a row of truncate triangles; on each side of this middle line there is a row of yellow spots, encircled in black; the size of the yellow spots goes on diminishing from the base to the tip; the yellow regions are clothed with a golden yellow pubescence; the black ones with a black pubescence; (the black varies in intensity in different specimens; in my male specimen it is very faint, the prevailing color of the abdomen being reddish yellow). Prevailing color of the venter yellow; in well preserved specimens with a delicate whitish pollen. Front legs: coxae yellowish white with long, soft white hairs; trochanters brownish, femora brownish yellow or yellowish brown, with a gray pollen; tibiae yellowish at the base, brownish on the latter half; tarsi brown. Middle and hind legs: femora brownish yellow, with a gray pollen, and with long, soft, whitish hairs; tibiae yellow; first joint of tarsi yellow, brownish at tip; the following joints brown, yellow at the base. The hind tibiae have a fringe of yellowish hairs, and are more or less tipped with blackish ones. Wings subhyaline, with but a very slight grayish tinge; costal cell tinged with yellowish; stigma yellow; the anterior branch of the third vein rather knee-shaped near its origin; first posterior cell broadly open. Length, 14–16 mm.

Hab. Middle States; Kentucky (Sanborn). A male and three females.

Observation. One of the female specimens before me differs from the others in its coloring. The face has a yellowish gray tinge, while in the other specimens the face is of a purer whitish gray; the pleurae also are more yellowish gray instead of whitish gray; the palpi are decidedly yellow, with yellowish hairs on the stout, basal half, and with black hairs on the slender portion of the second joint, while in the other specimens they are whitish; the femora are black, with a gray pollen, their tips yellow. I do not doubt the specific identity of this specimen. The black design on the abdomen is sometimes very faint (for instance, in the male specimen before me).

This species has an unmistakable resemblance to *T. costalis* in its coloring; but it is considerably larger, the markings on the abdomen are altogether different, the costal cell is tinged with a less saturate yellow, the ♀ front is comparatively narrower; the first joint of the hind tarsi is yellow, brown at tip in *T. fulvus* and altogether blackish in *T. costalis*.

27. *Tabanus sagax* n. sp.

Female. Face white, with white down; palpi rather stout, pale yellow, with short black hairs; antennae bright orange red; third joint rather long, its annulate portion much shorter than the body of the joint, deep black; its upper angle very little projecting; front comparatively broad, nearly parallel, yellowish gray; callosity broad, brownish, irregular, nearly square, rounded on top; above it another, oblong, denuded spot. Thorax light gray, clothed with microscopic yellowish hairs; pleurae and pectus whitish gray. Abdomen reddish, more brownish towards the end; a broad, conspicuous, whitish longitudinal stripe along the back, expanded at the incisures; on each side of the stripe a row of ill defined yellowish white spots, a pair on each segment, growing smaller towards the tip of the abdomen; venter yellowish red. Legs reddish yellow; tips of front tibiae slightly infuscated; front tarsi and tips of the four posterior tarsi brown. Wings hyaline; veins yellowish; costal cell tinged with yellow; stigma saturate yellow. Length, 13–15 mm.

Hab. Illinois; Minnesota. Three females.

Not unlike *T. fulvulus* in the markings on the abdomen; but the markings, as well as the thorax, are grayish, instead of fulvous; the front is much broader, the frontal callosity larger; the third antennal joint is narrow, its upper angle but very little projecting; the dorsal stripe on the abdomen comparatively broader.

The eyes of *T. sagax* have a purple band between two green ones, above and below which there is, on each side, another less well defined, purple band.

28. *Tabanus nigrescens*.

Tabanus nigræscens Palisot-Beauvois. Ins., Dipt., Tab. II. f. 2; Wiedemann, Auss. Zw., I. p. 116, 6.

Male and female. Head of the male more convex than that of the female; large and small facets distinctly separated; frontal callosity ($\frac{1}{2}$) much longer than broad, convex, black or dark brown, with a spindle-shaped prolongation above. Front grayish brown, brown in the middle; face brownish gray; cheeks with dark brown or black hairs; palpi black; antennæ black; base of the third joint red; its projecting angle almost rectangular. Thorax brown (of a more reddish brown in the female than in the male), with a faint grayish pollen anteriorly; no distinct stripes. Abdomen altogether black; legs black. Wings with a yellowish brown tinge, which is more saturate in the two basal cells; costal cell brownish (sometimes the wings have an altogether blackish tinge); stigma ferruginous brown; a blackish cloud on the crossvein between the discal and the second posterior cell, usually more or less extending over the crossvein next to it; a round, blackish cloud on the bifurcation of the third vein. Length, σ , 20 mm.; $\frac{1}{2}$, 22–23 mm.

Hab. New York (Catskill Mountain House, July, 1874); Massachusetts; New Jersey; Pennsylvania; Maryland; Illinois; Knoxville, Tennessee; a specimen ($\frac{1}{2}$) from Canada (Mr. W. Saunders) is smaller, and has very dark, almost blackish wings.

The eyes ($\frac{1}{2}$) are dark and dull green, with three narrow purple bands, the upper one is distinct at the beginning only. The description of Palisot, brief as it is, cannot be doubtful in its interpretation, especially with the addition of the figure of the whole insect and its antennæ.

29. *Tabanus punctifer* n. sp.

Tabanus punctifer Lew in litt.

Male and female. Head (σ) large, with distinctly separated large and small facets; front ($\frac{1}{2}$) broad (broader than in *T. nigrescens*); frontal tubercle large, somewhat ill defined in outline and rather flat; antennæ black, projecting angle of the third joint rectangular; face brownish; palpi black. Thorax and scutellum, above, whitish or yellowish white, in consequence of a dense pollen, covered by a pubescence of the same color; pleurae, pectus, abdomen and legs black, or dark brown; front tibiae white at the base for more than one third of their length. Wings brownish, especially on their proximal half; costal cell brown; a faint brown cloud on the crossvein at the base of the second posterior cell, which is not prolonged on the crossvein at the base of the third posterior cell; a dark brown round cloud at the bifurcation of the third vein. Length, σ , 19 mm.; $\frac{1}{2}$, 19–20 mm.

Hab. West of the Rocky Mountains; Utah, Sonora, California, etc.; also Colorado (G. Ridings); seems to be a common species.

This species is not unlike *T. stygius* Say, but is a little smaller, and easily distinguished

by the white color of the base of the front tibiæ, the blackish or brownish, and not ferruginous brownish, wings, the absence of distinct white lines on the thorax, etc. The head of the male is much larger than in *T. nigrescens*, and the large facets occupy much more surface.

30. *Tabanus stygius*.

Tabanus stygius Say, Journ. Acad. Phil., III, p. 33, 3; Wiedemann, Auss. Zw., I, p. 131, 31.

Female. Frontal callosity much longer than broad, chestnut brown, with a spindle-shaped prolongation above. Front brown; a grayish spot on the vertex; face yellowish brown; palpi black; antennæ dark reddish brown, annulate portion of third joint often darker; third joint much excised, and the upper angle very salient. Thoracic dorsum (in well preserved specimens) clothed with a white pollen, through which the brown ground color is but little apparent; longitudinal white lines very distinct; a short white pubescence makes the dorsum appear still whiter. Pleuræ and pectus dark brown or blackish brown, in sharp contrast with the white thoracic dorsum. Abdomen black, subopaque; venter black or dark brown. Legs black or dark brown; front tibiæ slightly reddish at the base. Wings strongly tinged with ferruginous brownish; a brown spot on the bifurcation of the third vein, and a small cloud on the crossvein at the base of the second posterior cell, more or less prolonged on the next crossvein. Length, 20–22 mm.

Hab. Connecticut (Southington, July, W. H. Patten); Pennsylvania; Maryland (Am. Ent. Soc.); Illinois (Le Baron); Iowa (Dallas Co., Jefferson Co., J. A. Allen); South Carolina (Sea Islands, June 2d, B. P. Mann); Florida (in the spring, E. Palmer).

Say must have had a denuded specimen, as the characteristic white coloring of the thorax is not mentioned in his description; Wiedemann's is more explicit. The eyes (as far as I saw them on an alcoholic specimen from Florida) are dark green with two dark purplish bands and the vestige of a third above; therefore similar to the eyes of *T. nigrescens*.

31. *Tabanus atratus*.

Tabanus atratus Fabricius, Syst. Entom., p. 789, 9; Entom. Syst., IV, p. 366, 16; Syst. Anth., p. 96, 16; Wiedemann, Dipt. Exot., I, p. 63, 2; Auss. Zw., I, p. 114, 3.—Macquart, Dipt. Exot., I, 1, p. 142, 41; Bellardi, Saggio, I, p. 58. — Harris, Ins. N. Engl., 3d Edit., p. 602.

Tabanus niger Palisot-Beauvois, Ins., Dipt. Tab. I, f. 1.

Tabanus americanus Drury Ins., I, Tab. 44, f. 3.

Tabanus validus Wiedemann, Auss. Zw., I, p. 113, 2.

Male and female. Altogether black; head of the male large, subhemispherical, the large facets occupying an extended area, distinctly separated from that of the small facets; front (♀) unusually broad; callosity broader than long; subcallus denuded, shining; third antennal joint deeply excised, its upper corner very salient, pointing forward, its narrow portion remarkably long, gradually merging into the annulate tip; front tibiæ whitish at base, hind tibiæ with a fringe of black hair; abdomen usually with a bluish white efflorescence; wings black or brown; first posterior cell strongly coarctate, often altogether closed. Length, ordinary specimens, 20–26 mm.; small ones down to 16 mm.

Hab. United States, common. I have specimens from Quebec, Can., Maine, Massachusetts, where it is not rare (Cambridge, Nahant, Chelsea Beach), District of Columbia, Maryland, Indiana, Kentucky, Florida, Kansas, Nebraska, Texas. Bellardi had it from Mexico.

This species varies in appearance very much. Northern specimens, for instance those found round Boston, often have the wings pale brown, even yellowish brown, towards the posterior margin. The most remarkable variety, however, I received from Florida (Indian River, E. Palmer; Haulover Beach, March 12-14, Messrs. Hubbard and Schwarz); the thorax on each side bears a fringe of golden yellow hairs, not a trace of which is visible in ordinary specimens. I have four specimens from Florida, and two from some other southern locality not nearer defined, which show this peculiarity. A very small specimen from Key West (Feb. 7, 1869, in Mr. E. Burgess' collection) has none of these hairs. The very broad front, broad frontal callus, shining subcallus and coarctate first posterior cell, prove, I think, the specific identity of all these varieties.

The *T. validus* Wiedemann is, to all appearance, based upon a brownish or reddish colored specimen of *T. atratus*. Drury's name, *T. americanus* (1773), although the oldest, cannot have the priority on account of *T. americanus* Förster (1771), which is *T. ruficornis* Fab.

The eyes of *T. atratus*, according to Dr. Harris (Ins. Inj. to Veget., 3d Edit., p. 602), "are of a shining purple black or bronzed black color, with a narrow jet black band across the middle, and a broad band of the same hue on the lower part." I have revived, on wet sand, the eyes of specimens from Texas and from Massachusetts (with the yellowish hind border of the wing), and have found them to agree with this description.

32. *Tabanus Wiedemanni*.

Tabanus ater Wiedemann (non Palisot-Beauv.) Auss. Zweifl., I, p. 136, 39 (ex parte; non Dipt. Exot.).

Female. Altogether black, with a slight brownish pollen on the thorax, grayish in front. Face and front also with a brownish pollen; antennæ black, upper angle of third joint very salient; the basal portion of this joint rather broad; annulate portion not longer than the basal portion. Frontal callus square, black, shining, prolonged upwards as a black, shining stripe, not quite reaching the vertex, and nearly as broad as the callus, leaving but a narrow strip of the brownish front on each side; subcallus less shining, somewhat denuded. Wings dark brown; a still darker brown cloud on the bifurcation of the third vein; first ^{Posterior} ~~basal~~ cell perceptibly coarctate. Length, 16 mm.

Hab. Enterprise, Florida, May 17, 1875. Messrs. Hubbard and Schwarz.

Wiedemann described *T. ater* for his Diptera Exotica from Westermann's collection in Copenhagen. Later, when writing his "Aussereurop. Zweifl. Ins.," he identified a specimen of the Vienna Museum with his earlier description (without having the original specimens before him), but added: "It agrees very well with my description, only the coloring, especially of the abdomen, is more blackish brown than deep black. The front is very smooth, has a transverse subcallus and *above it a broad, smooth stripe, running towards the vertex.*" This addition, and especially the last character, proves, to my mind, that Wiedemann had the present species before him; but whether his former description refers to the same species, seems doubtful to me. In several details (very small tooth of the third antennal joint, front shining black, very convex front behind the antennæ) that description points to *T. lugubris*; only the size of the female, seven lines, is too large for it. At any rate, the name *T. ater* cannot be used, on account of the much older *T. ater* Rossi (1790).

T. Wiedemanni is easily distinguished from *T. atratus* by its smaller size, much narrower front, the shape of the callosity and of the stripe above it, the shape of the third antennal joint, which is much less excised, the brown cloud on the bifurcation of the third vein and the less coarctate first posterior cell.

From *T. lugubris* the present species differs in its somewhat larger size, its less shining surface, in the structure of the antennæ, the shape of the callosity with prolongation, the less convex subcallus and the cloud on the bifurcation of the third vein.

33. *Tabanus lugubris*.

Tabanus lugubris Macquart, Dipt. Exot., I, 1, p. 145, 48.

Tabanus ater Palisot-Beauvois, Ins., Dipt. Tab. II, f. 5.—Wiedemann, Dipt. Exot., I, p. 74, 23; Auss. Zw., I, p. 136, 39 (ex parte).

Female. Antennæ black; third joint long; annulate portion especially elongate; body of the joint comparatively small, its upper angle well marked, nearly rectangular, but not drawn out. Face and cheeks black, shining, with a little brownish pollen in the middle of the former, between the furrow; palpi deep black. Front black, shining, some traces of a grayish pollen visible on the sides, above the callosity; the latter large, convex; subcallus also very convex, black, shining. Thorax and abdomen black, shining, with a thin brownish pollen; thorax in front with some grayish pollen. Legs black. Wings uniformly black; first posterior cell perceptibly coarctate. Length, 13–14 mm.

Hab. Carolina (Macquart); Sea Islands, South Carolina, June 2d (B. P. Mann). A single female.

The shape of the third antennal joint of this species is characteristic; unfortunately, Macquart could not describe it, as it was wanting in his specimen. Nevertheless, the description leaves but little doubt about the identification.

Palisot's short description and figure seem to refer to this species rather than to *T. Wiedemanni*. Compare especially the side view of the very convex subcallus. Moreover, it is not probable that Palisot, in the then existing state of descriptive entomology, would have distinguished *T. Wiedemanni*; he would have probably taken it for a small *T. atratus*, the resemblance between the two species being very great. About Wiedemann's interpretation compare the observation at the end of the description of *T. Wiedemanni*. As there is a much older *T. ater* Rossi (Fauna Etrusca, 1790), Macquart's name must be adopted.

34. *Tabanus rufus*. *see supp. P. IV.*

Tabanus rufus Palisot-Beauvois, Ins., Dipt. Tab. II, f. 1, p. 100. — Wiedemann, Auss. Zw., I, p. 117, 8 (merely a translation of Palisot's description).

Tabanus fumipennis Wiedemann, Auss. Zw., I, p. 119, 11.

Female. Face reddish yellow; palpi rather long and slender, reddish; front rather broad, parallel, yellowish brown; callosity not longer than broad, chestnut brown, or dark brown, with a spindle-shaped prolongation above. Antennæ pale red, third joint much excised, its upper angle very salient and slightly drawn out forward. Thorax more or less brown above, with a delicate grayish pollen and faint reddish lines, more reddish on the sides; pleuræ and pectus yellowish, with yellowish hair. Abdomen ferruginous reddish, with a longitudinal blackish stripe, which expands posteriorly and occupies nearly the whole

dorsal surface of the three last segments. Legs yellowish red; front tarsi brownish. Wings strongly infuscated; a distinct brown cloud on the bifurcation of the third vein, a very faint one on the crossvein at the base of the second posterior cell. Length, about 23 mm.

Hab. Savannah, Georgia (Wiedemann); Florida (Lake Harney, May 4, Messrs. Hubbard and Schwarz); S. Carolina (Sea Islands, June 2, B. P. Mann). I have four females.

The cloud on the bifurcation of the third vein is not mentioned by Wiedemann; it nevertheless exists in his original specimen in the Vienna Museum (as Dr. Redtenbacher kindly informs me). The eyes of this species (as I saw them on an alcoholic specimen) have three narrow bluish stripes, not reaching the external border; the ground color of the eye was reddish green.

35. *Tabanus Megerlei*.

Tabanus Megerlei Wiedemann, Aus. Zw., I, p. 132, 32.

Female. [Antennæ brown, root of the third joint ferruginous yellow, with a strong tooth; face brown, somewhat yellowish on the sides; cheeks and palpi brown; beard black; front yellowish white below, lighter in the middle, the upper part yellowish.] Callosity nearly square, brown or black, convex. Thorax blackish, reddish on each side, with whitish lines on the dorsum; pleuræ brown, with black hair. Abdomen reddish, with a broad black stripe in the middle, which is somewhat narrower on the second and third segments; a whitish pollen and a golden yellow pubescence clothe the red portions of the abdomen; lateral margins blackish, fringed with black hair. Venter reddish. Wings brownish on the proximal half, especially along the veins; crossveins and bifurcation of the third vein with dark brown clouds. Length, 17–18 mm.

Hab. Florida (caught by myself on St. John's River in March, 1858). A single female.

T. Megerlei is described by Wiedemann without indication of locality. My specimen agrees perfectly with his description. At present this specimen is somewhat injured about the head, so that I am compelled to translate from Wiedemann the portion of my description enclosed in brackets. The black fringe of hair along the edges of the otherwise red abdomen of this species cannot well be mistaken. In the present condition of my specimen I cannot well ascertain whether its eyes are pubescent or ^{glabrous} ~~pubescent~~, and whether it has an ocellar tubercle or not.

36. *Tabanus americanus*.

Tabanus americanus Förster, Nov. Spec. Centur., I, 100.

Tabanus plumbeus Drury, Ins. I, Tab. 44, f. 2.

Tabanus ruficornis Fabricius, Syst. Ent., p. 789, 8; Ent. Syst., IV, p. 365, 14; Syst. Anth., p. 96, 14.—Wiedemann, Dipt. Exot., I, 62; Aus. Zw., I, p. 112, 1.

*Tabanus limbatu*s Palisot-Beauvois, Ins., Dipt. Tab. I, f. 2.

Female. Dark violet brown ("obscure coccinellus" of Wiedemann) sometimes more reddish. Face grayish, with gray hair; front grayish; antennæ red; in some specimens the annulate portion is brown; third joint deeply excised; its upper angle drawn out, as a pointed horn; frontal callus chestnut brown, prolonged in a line above; palpi brownish red, with dense, short black hairs. Thorax with a whitish efflorescence, hardly concealing the dark ground color; a tuft of white hairs between the root of the wings and the scutellum.

Pleuræ with a whitish down and with longer white hairs, especially between the root of the wings and the base of the abdomen; abdomen covered with a thin whitish efflorescence, not concealing the ground color, but visible in an oblique light; it is more perceptible along the hind margins of the segments, where, on each side, it becomes broader and very distinct; hind margins of the ventral segments also whitish. Legs brownish red, tarsi darker; hind tibiæ with fringes of dark hairs. Wings hyaline, costal cell and stigma infuscated; first posterior cell somewhat coarctate.

Male. Head large, subhemispherical, like that of *T. atratus* in shape; the large facets occupy a very extended area, and are distinctly separated from the small ones. Hairs on head and chest more yellow than in the female. (I have only a single specimen, from Florida, before me.) Length, 25–30 mm.

Hab. Middle and Southern States. I have seen specimens from Illinois; Sea Islands, S. C.; Florida (Ft. Capron, Fla., April 25, Messrs. Hubbard and Schwarz); Kentucky; Missouri; Pennsylvania; Detroit, Mich. (Mr. Hubbard). From Mr. Akhurst I received a specimen caught in the State of New York.

Förster's name, being the oldest (1771), should have the priority. Drury's description and figure are older, but the name *T. plumbeus* Drury, appears only in Vol. II, Appendix (1773). Förster is wrong in quoting Drury's figures, 2 and 3; the latter is *T. americanus* Drury (Syn. *atratus* Fab.). This is the largest of the North American Tabani, and seems to be very common in some parts of the south and west. The eyes are unicolorous, of a brilliant green.

37. *Tabanus giganteus*.

Tabanus giganteus DeGeer, Ins., VI, p. 226, 1; Tab. XXX, f. 1.

Tabanus lineatus Fabricius, Spec. Ins., II, p. 455, 4; Entomologia System., IV, p. 363, 5; Syst. Antl., p. 94, 3.—Wiedemann, Dipt. Exot., I, p. 63, 3; Auss. Zw., I, p. 115, 4.

?*Tabanus bicolor* Macquart, Dipt. Exot., 2^e Suppl., p. 34, 129 (♀).

?*Tabanus cresiofasciatus* Macquart, Dipt. Exot., 5^e Suppl., p. 32, 126 (♂).

Female. Front rather narrow, grayish; frontal callus chestnut brown, prolonged upwards as a narrow, smooth line; face whitish yellow or yellowish white; palpi reddish yellow, beset with golden yellow and black hairs. Antennæ red, third joint deeply excised, upper angle projecting, horn-like. Thorax brownish above, more or less clothed with grayish pollen, with indistinct darker stripes and reddish lines between them; scutellum usually reddish, with a black spot at the base. Pleuræ and pectus clothed with yellowish or whitish hairs. Abdomen blackish, more or less covered with a white efflorescence; the sides of the abdomen, especially on the second segment, reddish; incisures more or less whitish. Legs brownish red; tarsi darker; hind tibiæ with a fringe of black hair. Wings tinged with pale brown; costal cell and stigma ferruginous brownish; first posterior cell but slightly coarctate. Length, 22–25 mm.

Hab. Middle and Southern States. I have seen specimens from Connecticut (Suffield, G. Dimmock), Pennsylvania, Illinois, Missouri, Arkansas, Sonora. Dr. Harris's Catalogue quotes this species from Massachusetts.

The eyes of this species are unicolorous. DeGeer's *T. giganteus* is evidently this species; about the confusion existing between it and *T. calens* Linné, see Wiedemann, Auss. Zw., I, p. 135.

I do not see any thing in Macquart's description of *T. bicolor*, which would prevent the interpretation I give it. Anyhow, the name cannot stand, as there is an earlier *bicolor* by Wiedemann. Observe at the same time that Macquart does not mention *T. lineatus* anywhere in his works.

In Mr. C. V. Riley's collection I find a very much damaged specimen, which I take to be the male of this species, the only one I have seen. The head is flattened above, and not very large. The demarcation between the large and small facets of the eye is distinct, although the large facets are comparatively smaller than in the allied species. Macquart says of his *T. casiofasciatus* ♂: "Yeux nus, composés entièrement de fort petites facettes," which rather confirms me in the belief that this is the male of *T. giganteus*.

38. *Tabanus mexicanus*.

Tabanus mexicanus Linné, Syst. Nat., II, p. 1000, 10.—Fabricius, Spec. Ins., II, p. 457, 16; Ent. Syst., IV, p. 367, 22; Syst. Anth., p. 98, 25.—Wiedemann, Dipt. Exot., I, p. 76, 29; Auss. Zw., I, p. 147, 58.—Macquart, Dipt. Exot., I, 1, p. 143, 43.

Tabanus punctatus Fabricius, Ent. Syst., IV, p. 368, 25.

Tabanus inanis Fabricius, l. c., 26.

Tabanus ochroleucus Meigen, System. Besch., II, p. 62, 41. (Meigen erroneously took it for European.)

Tabanus olivaceus DeGeer, VI, p. 230, 6; Tab. 30, f. 6. (DeGeer quotes Linné.)

Tabanus sulphureus Palisot-Beauvois, Ins., p. 222, Dipt. Tab. III, f. 3.

Tabanus flavus Macquart, Hist. Nat. Dipt., I, p. 200, 13; Guérin et Percheron, Genera, etc., Dipt. Tab. II.

Tabanus viridiflavus Walker, Newman's Zool., VIII, App. lxxi ("fide Walker," thus quoted by Bellardi, Saggio, I, p. 59).

The whole body is pale yellowish, more or less tinged with greenish; palpi yellow, slightly incrassated at the base of the second joint; antennæ of the same color, sometimes green; upper angle of the third joint projecting, rectangular; front nearly parallel, without any callosity; the head of the female being large, the front, for a *Tabanus*, has an unusual length. Thorax densely clothed with yellow hairs. Wings subhyaline, sometimes slightly tinged with yellowish; costal cell and stigma yellow; crossveins and bifurcation of the third vein usually (not always) clouded with brown; according to Wiedemann, brown clouds sometimes also occur on the tips of the veins, along the margin; but this probably applies to the South American species, which he had before him. All my specimens ~~are~~ have a stump of a vein on the bifurcation of the third vein.

Hab. Florida; South Carolina (Sea Islands, May 17, 1869, B. P. Mann); New Jersey (Am. Entom. Soc.); Missouri (Riley); Mexico (Bellardi); South America (Wiedemann).

I never saw this species alive, but believe that in that state the green color must be more distinct; in dry specimens only traces of it remain, very irregularly distributed over the body. The synonymy of Fabricius's names I borrow from Wiedemann, who saw the original types; the same for Meigen's *ochroleucus*.

About his *T. flavus* Macquart says that the type is in Percheron's cabinet; Percheron's figure deserves, therefore, full credit. It is strange, nevertheless, that while Macquart expressly mentions the absence of the stump on the fork of the third vein, Percheron figures this stump as very long; Macquart mentions a dark spot at the base of the fork, Percheron neither figures nor mentions it! I do not know how to explain these contradictions in the face of a synonymy which cannot be doubted.

Palisot's figure of the front of his *T. sulphureus* shows the absence of the callosity, and thus unmistakably points to *T. mexicanus*.

B. Tabani with pubescent eyes, but without ocellar tubercle.

39. *Tabanus bicolor*.

Tabanus bicolor Wiedemann, Dipt. Exot., I, p. 96, 58; Auss. Zw., I, p. 188, 115; *male*.

Tabanus ruficeps Macquart, Dipt. Exot., 5^e Suppl., p. 35, 130; *male*.

Female. Eyes pubescent; head comparatively broad; face pale yellowish; palpi short and turgid, yellowish, with sparse, black hairs; front and vertex yellowish; no frontal callosity; antennae reddish yellow, third joint remarkably broad and comparatively short. Thorax brownish yellow, in consequence of the dense pollen which conceals the brownish olivaceous ground color; the pleurae somewhat grayish. Legs reddish yellow. Abdomen reddish on the sides, yellowish brown in the middle and at the tip (the latter color being the effect of a brown ground color covered with brownish fulvous pollen and fulvous hairs). Wings hyaline; veins yellow.

Male. Head large, but not flattened on top; large and small facets distinctly separated; thorax somewhat more yellowish than in the female, the yellow hair upon it being more dense. Abdomen reddish yellow, with a dark longitudinal stripe, which is narrowest in the middle, but varies in breadth in different specimens. Length, 10–11 mm.

Hab. New York; Pennsylvania; Illinois; Canada. I have three male and two female specimens before me.

The male of this species is more frequently met with in collections than the female. Although Macquart says "yeux nus" of his *T. ruficeps*, I have not the slightest doubt that it is the same as *T. bicolor* Wied.

40. *Tabanus fulvescens*.

Tabanus fulvescens Walker, List, etc., I, p. 171.

"*Mus.* Fuscus, capite flavo-albido, thorace fusco, pectore cano, abdomine fulvo, fusco nunquam vittato, pedibus flavis, alis limpidis.

"Head yellowish white, clothed beneath with white hairs; feelers and palpi yellow; eyes red; chest pale brown, clothed with tawny hairs; breast hoary, clothed with white hairs; abdomen tawny, slightly clothed with tawny hairs, and having a broad grayish brown stripe, which appears only at the base of the underside; legs yellow; wings colorless; wing ribs and veins tawny, the latter piceous towards the tip; poisers yellow.

"Length of the body, $4\frac{1}{2}$ lines (11–12 mm.); of the wings, 9 lines.

"*a.* Massachusetts. From Prof. Sheppard's collection

"*b.* ———?"

"Var. Abdomen not striped."

I have two specimens (male and female) from Canada (Quebec, Mr. Belanger, and Portneuf, Mr. Provancher) which agree quite well with this description, except that, in the male, the brown longitudinal stripe runs along the whole venter, and that the tarsi are infuscated at the tips. The body of the female is darker; the tips of the front tibiae are infuscated; the front tarsi are brown, except at the base.

This species (if it be distinct) resembles *T. bicolor* very much in its general appearance, in the absence of a frontal callosity, in the pubescence of the eyes, etc. It is easily distinguished, however, by the whitish gray color of pectus, pleuræ and front coxæ, which color also appears on the cheeks and around the mouth. The third joint of the antennæ (in my two specimens at least) is slightly narrower; the general coloring of the body, especially in the female, is darker.

41. *Tabanus Reinwardtii*.

Tabanus Reinwardtii Wiedemann, Auss. Zw., I, p. 130, 30.

Tabanus erythrotelus Walker, Ins. Saunders, p. 25; Tab. II, f. 1.

Female. Front rather broad, grayish, with a well marked brown crossband in the middle and a dark spot on the vertex; frontal callosity large, nearly square, brown, prolonged as a line above; face and cheeks white, with white hair; palpi moderately stout, yellow, with a grayish pollen, and short black hairs; antennæ: first and second joints reddish (in some specimens almost black), with black hair; the third black, red at base; upper angle well marked, projecting, nearly rectangular. Thorax grayish slate color, sometimes more blackish; more or less reddish on the sides and along the suture; the usual gray stripes are well marked and beset with whitish hairs in well preserved specimens. Pleuræ and pectus whitish, beset with white hairs; on the pleuræ a faint reddish ground color is often apparent; a fringe of black pile between the root of the wings and the humerus. Abdomen grayish slate color, usually faintly reddish on the sides; an intermediate row of triangular and lateral rows of oblique whitish spots; hind margins of segments fringed with short white hairs. Venter densely clothed with white pollen and short white hairs, the latter especially on the hind margins of segments, the ground color being blackish, or pale reddish. Legs pale reddish or yellowish, clothed with grayish pollen and white hairs; tarsi nearly black; all the tibiæ blackish at tip, front tibiæ up to their middle, (in some specimens the femora, especially the front femora, are darker). Wings subhyaline; central crossveins, crossveins at the end of the discal cell, and bifurcation of the third vein, distinctly clouded with brown; ~~front~~ posterior cell very slightly coarctate.

Male. Antennæ usually black, except the extreme root of third joint; face and cheeks grayish, with blackish hair; legs darker, femora nearly black; thorax blackish, with dense blackish and gray pile; antealar callus reddish; abdominal markings much less well defined; white hairs on the abdomen longer; brown clouds on the wings less well marked. The line between the large and small facets on the eyes well defined, although the large facets are comparatively smaller than in other species. (In life a single green stripe on purple ground on the lower part of the eyes.) Length somewhat variable, the usual size 16–18 mm.; sometimes only 14 mm. My male specimens measure about 16 mm.

The eyes are pubescent in both sexes; very distinctly in the male.

Hab. Canada (Bélanger, Provancher, Couper); Iowa (Jefferson and Dallas Counties, J. A. Allen); Illinois; Vermont (Bridgport, Miss A. M. Edmands); Virginia; Pennsylvania (Am. Ent. Soc.). I have ten female and three male specimens.

The description of the legs of *T. erythrotelus* Walker does not agree with this species; but Westwood's figure which is appended, the locality (Bolton, N. Amer.), and the non-

existence of any other species with which to identify the description, render the synonymy certain. In this species the ocellar tubercle is not visible; the pubescence of the eyes in the male is very distinct; in the female very short, and often hardly visible. The coloration of the eyes of the female (revived on wet sand) appeared not unlike that of *T. tri-junctus*, *calendulus*, and that whole group: two bluish green stripes, with a rather broad interval; the lower stripe bent towards the upper one at the outer end, without, however, reaching it.

42. *Tabanus cerastes* n. sp.

Female. Eyes pubescent; face white, with white hair; palpi rather stout, pale yellow, with white, mixed with a few black hairs; antennae reddish, third joint very deeply excised, almost crescent-shaped, upper angle drawn out in a rather long horn, which, as well as the annulate portion of the third joint, is black; sometimes the whole joint, except the base, is brownish; front moderately broad, grayish yellow; callosity brownish red, large, square; a spindle-shaped brown line above it is usually disconnected from it; (in my three specimens this line has a well marked groove in the middle, which ends in a deep puncture on the callosity; this may be a merely adventitious character of the species). Thorax of a light chocolate brown with whitish lines; pleurae whitish, with white hair. Abdomen of a light chocolate brown, with white triangles in the middle, and rather large, oblique, white spots on the sides. Venter densely clothed with whitish pollen, and with a trace of a longitudinal brown stripe. Feet reddish, whitish pollinose, and with white hairs; tips of tibiae and all the tarsi brown. Wings subhyaline, faintly tinged with brownish between the root and the stigma; first posterior cell broadly open. Length, 15–16 mm.

Hab. Kentucky (Bee Spring, June, F. G. Sauborn); Wisconsin (R. Kemmick).

The long horn-like upper angle of the antennae, as well as the peculiar brown coloring, renders this species easily recognizable. *T. scitus* Walker seems to have antennae of the same structure; in other respects its description is entirely unmeaning. The words "antennes à dent un peu allongée," in Macquart's description of his *T. hirticollatus* ♂ (Dipt. Exot., 5^e Suppl., p. 33), together with the pubescent eyes, may indicate the unknown male of my *T. cerastes*; still the data of the description are not sufficient to warrant the identification of the female. The eyes of an alcoholic female showed a single bluish stripe in the middle.

C. Tabani with pubescent eyes and with an ocellar tubercle (subgenus *Therioptectes*).

43. *Tabanus flavipes*.

Tabanus flavipes Wiedemann, I, p. 137, 41.

Female. Eyes pubescent, face yellowish gray, with dense yellow hair on the cheeks; some blackish hairs below the eyes; palpi long and narrow, black. Antennae dark red; third joint black on its distal half, excised above, and with a projecting upper angle; front rather broad, narrowed anteriorly, dark grayish; callosity very convex, with a more or less spindle-shaped prolongation above; the subcallus in all my specimens is denuded, shining. Thorax black, with black, erect pile, mixed with yellowish hairs, especially in front; antealar tubercle black; pleurae black, clothed with sparse yellowish hairs, which are denser

under the wings. Abdomen black, thinly clothed with pale golden yellow hairs, which are more dense along the hind margins of the segments, where they form narrow, but conspicuous pale golden yellow fringes. Venter black; hind margins of segments likewise fringed with pale yellow hairs. Front femora black, reddish at tip; front tibiæ reddish yellow, blackish at tip; front tarsi black; four posterior femora black on the proximal half only; the remainder, as well as the tibiæ and tarsi, reddish yellow. Wings tinged with brownish, brownish ferruginous along the costa. Length, 14–17 mm.

Hab. Labrador (Dumplin Harbor, July 19, common, A. S. Packard). Wiedemann's specimens were from the same country. I have six females.

Among Mr. Packard's specimens from Straits of Belle Isle, I find a male, which apparently belongs here. The sides of the second abdominal segment are reddish. The head is moderately large, and the difference between the large and small facets well marked, although not very considerable.

According to Wiedemann, this species is very like the European *T. auripilus* Meig.

There is a superficial resemblance between this species and *T. zonalis*; they are easily distinguished, however, by the much broader yellow borders of the abdominal segments and the reddish antealar tubercles of *T. zonalis*. The front of *T. flavipes* is broader, the palpi narrower, etc.

44. *Tabanus zonalis*.

Tabanus zonalis Kirby, Fauna Boreali-Americana, IV, p. 314, 2.

Tabanus tarandii Walker, List, etc., I, p. 156; *female*.

Tabanus terra-nova Macquart, Dipt. Exot., 4 Suppl., p. 39, 169.

Female. Eyes pubescent; third joint of antennæ red, more or less black at tip (sometimes the annulate portion alone is black, sometimes this color extends beyond it), distinctly excised above, with a projecting upper angle; face and front clothed with a golden yellow (in some cases whitish yellow) pollen; cheeks with fulvous and black hairs; frontal callosity black, nearly square, with a spindle-shaped, often disconnected line above; vertex black; palpi brown, densely clothed with black hair. Thorax black, antealar tubercle reddish. Abdomen black, hind margin of all segments with a broad yellow border, formed by yellow pollen, clothed with golden yellow hairs; on the second, and sometimes on the third segments, this border has, anteriorly, a shallow excision, bounded on each side by a pointed projection; venter black, the hind margins of the segments also bordered with yellow. Femora black, reddish at the tip; tibiæ and tarsi reddish yellow; front tibiæ at the tip, and front tarsi, black; hind tibiæ with a distinct fringe of reddish hair. Wings tinged with brownish; ferruginous brownish along the costa. Length, 17–18 mm.

Hab. Has a wide distribution in the northern regions of North America; Maine (Fernal); northwestern parts of the Hudson's Bay Territory (R. Kennicott); Saskatchewan River (Scudder); Washington Territory (G. Gibbs); Labrador (Packard); Canada (Quebec, Bélanger); Anticosti (Verrill); St. Martin's Falls, Albany River, Hudson's Bay (Walker); Newfoundland (Walker and Macquart). I compare twenty-four female specimens.

In old and worn specimens the yellow portions of the body appear more whitish. The typical specimen described by Kirby must have been in that condition, as appears from his description. The mention of the reddish antealar callosity, as well as the measurement

(7½ lines) given by Kirby, prove that he meant the above described species, and not *T. flavipes*. The eyes of the female (revived on wet sand) showed four dull green stripes, the upper and lower one not defined on the outside, very like the eyes of *T. cinctus*.

45. *Tabanus cinctus*.

Tabanus cinctus Fabricius, Ent. Syst., IV, p. 366, 18; Syst. Anth., p. 97, 20; Meigen, Syst. Besch., etc., II, p. 42, 16 (where this species is erroneously quoted as European, an error corrected afterwards in the preface to the third volume).—Wiedemann, Dipt. Exot., I, p. 67, 10; Auss. Zw., I, 119, 12. — Harris, Ins. New Engl., 3d Edit., p. 602, fig. 261.

Male and female. Eyes pubescent; face brownish gray, beset on the cheeks with blackish hair; palpi black, or dark brown; front (♀) yellowish brown; callosity chestnut brown, square or semi-oval, with a black, irregular prolongation above; ocellar tubercle very distinct. Thorax black, somewhat shining, beset with black hair. First three segments of the abdomen yellowish red, beset with fulvous hair; an inverted black triangle rests with its base against the scutellum, and occupies with its apex the middle of the second segment; remaining segments of the abdomen deep black. Legs black. Wings brownish. Length, 18–19 mm.

Hab. Massachusetts; White Mountains, N. H. (H. K. Morrison); Connecticut (Southington, in July, W. H. Patton); Pennsylvania; Maryland (Am. Entom. Soc.); Georgia (J. Ridings); Virginia (Wiedem.). Mexico [?] (Walker, List, etc., I, p. 153).

In the male of this species the difference between the large and small facets of the eyes is hardly perceptible, and the line of demarcation between them is indistinct (at least in dry specimens). The eyes of the female show four dull green stripes, the upper and lower ones of which are not distinctly defined on the outside. The pubescence on them is very difficult to ascertain. This seems to be closely related to *T. trispilus*.

46. *Tabanus trispilus*.

Tabanus trispilus Wiedemann, Auss. Zw., I, p. 150, 62.

Female. Face yellowish gray, with yellowish hairs on the cheeks; palpi yellowish, beset with short, black hair; front gray; callus black, semi-oval, prolonged above in a somewhat spindle-shaped line; ocellar tubercle very distinct, reddish; antennæ red, first joint with gray pollen; the third joint black on its distal end, broad, with a salient upper angle and a shallow excision. Thorax blackish gray, with two faint longitudinal gray stripes and a gray line between them; under the lens these gray stripes appear beset with minute fulvous hair; antealar tubercles reddish; pleuræ gray, beset with pale yellowish, whitish and black hair. Abdomen grayish black (dark slate color), darker than the thorax; hind margins of segments with a narrow whitish border, beset with a fringe of whitish hairs; in the middle of this border, on segments two to five, a very distinctly defined white triangle, occupying the whole breadth of the segment; that on segment two is the largest, this segment being the broadest; that on segment five is very small, often almost obsolete; there is also a small whitish spot in the middle of the first segment, under the scutellum; the lateral margins of the abdomen are whitish, and beset with white hairs. Venter whit-

ish gray, with a broad blackish longitudinal stripe in the middle. Legs black: proximal half of the tibiæ more or less reddish brown. Wings tinged with brownish gray; a shade of brownish runs from the stigma across the central crossveins; costal and basal cells also with a faint brownish tinge; first posterior cell open.

Male. Much darker in coloring than the female. Head of moderate size; the demarcation between the large and small facets is hardly visible, as these facets differ in size but very little. Thorax black, beset with black hair; anteriorly some grayish pollen and yellowish hair; longitudinal stripes obsolete; antedax tubercle dark reddish; pleuræ beset with yellowish hairs, and with blackish ones in the middle; abdomen black, often dark brown on the sides of the second and third segments; white triangles on segments two and three very distinct, silvery white, that on segment four smaller, often subobsolete; the hind margins of the segments have no fringe of white hair, but a narrow border of whitish pollen is visible in a certain light. Venter black or brown; hind margins of segments white. Wings with a brownish tinge, somewhat more saturate than in the female. Length, 14-15 mm.

Hab. New England (Cambridge, Mass., in July, White Mountains, July 13, S. H. Scudder; Southington, Conn., July, W. H. Patton); Illinois; New York; also Middle States (Am. Ent. Soc.). I have three males and seven females before me.

The eyes are pubescent; in the female, however, the pubescence is very difficult to perceive. The eyes of the female show four bright green stripes, with purple intervals of nearly the same breadth.

I had some doubts about the identification of this species with the *T. trispilus* of Wiedemann; first, because he does not mention that the eyes are pubescent, although he had a male specimen, in which his pubescence is usually very distinct; secondly, because he calls the pubescence on the cheeks *brownish*, while it is yellowish gray. Through Dr. Redtenbacher's kindness I have been able to remove these doubts. He has caused Wiedemann's type in the Vienna Museum to be examined, and informs me that it has distinctly pubescent eyes, and that the hairs on the cheeks are grayish, and not brownish.

47. *Tabanus lasiophthalmus*.

Tabanus lasiophthalmus Macquart, Dijt. Exot., I, 1, p. 143, 45.

Tabanus notabilis Walker, List., etc., I, p. 166.

Female. Eyes pubescent; face yellowish white, with hair of the same color; palpi rather stout, whitish yellow, with white and more or less black hair; front rather broad, slightly converging anteriorly, yellowish gray, mixed with brown, and with short black pile; frontal callosity black; below it the subcallus is usually bare, black, shining; above the callosity a small, denuded blackish spot, usually disconnected from it, and surrounded with a brownish shade; ocellar tubercle very distinct, a brownish shade around it; antennæ reddish, more or less black at the tip of the third joint, the latter with a projecting, nearly rectangular, upper angle. Thorax grayish black, with a shade of brown; the usual longitudinal grayish lines, in well preserved specimens, are beset with fulvous hair; antedax tubercle somewhat reddish; pleuræ gray, with whitish hair. Abdomen brownish black in the middle, yellowish or reddish brown on the sides; large oblique yellowish white lateral

spots on each segment, gradually diminishing and becoming more rounded posteriorly; at the middle of the hind margin of the segments a small fringe of yellowish hair, sometimes assuming a subtriangular shape. Venter yellowish, often more or less blackish, clothed with a thin grayish pollen and yellowish hairs. Legs yellowish red, base of femora, to a greater or less extent, black; tarsi black, except the base of the four posterior ones, which is reddish; tips of front tibiae blackish. Wings hyaline; crossveins and bifurcation of the third vein clouded with brown; first posterior cell broadly open.

Male. Face dark grayish, beset with blackish hair; antennae darker; third joint more narrow; thorax clothed with denser blackish pile, gray lines less distinct; legs black, tibiae and base of four posterior tarsi reddish brown. Length, 12–16 mm., both sexes being rather variable in size.

Hab. United States and British Possessions; not rare. (Massachusetts; Maine; Detroit, Mich.; Illinois; Quebec, Canada, etc.)

I have seen Walker's *T. notabilis* in the British Museum.

48. *Tabanus affinis*.

Tabanus affinis Kirby, Fauna Bor.-Amer., IV, p. 313, 1.

Female. Eyes pubescent; palpi brownish yellow, with short black hairs; second joint moderately stout at base; face yellowish gray; antennae dark red, third joint black on its latter half, its basal portion rather broad, the upper angle projecting and the excision well marked; front dark yellowish gray, somewhat convergent anteriorly, clothed with black hair; callosity black (seldom reddish), rather small for the size of the species, with a usually spindle-shaped prolongation; ocellar tubercle brownish black, very distinct. Thorax dark grayish black with a tinge of brownish, and with more or less distinct gray lines; antealar tubercles reddish. Sides of the first four abdominal segments rufous, which color leaves a black stripe in the middle, narrowest on the second segment, and expanding on the third and fourth (in some specimens the fourth segment is almost black, with only a rounded reddish spot on each side; in others the red color invades even the fifth segment); on each of the segments two to five, on the black stripe, there is a triangular whitish yellow spot (formed by pollen overgrown with pubescence), the last of which, on segment five, is subobsolete; hind margins of segments yellowish, with a fringe of yellowish hairs; better preserved specimens show, on segments two and three, traces of lateral oblique yellowish spots. Venter rufous, last two or three segments black. Front legs black, base of tibiae reddish; on the hind legs the end of the femora, the tibiae and tarsi are rufous; tibiae with a fringe of black hairs. Wings with a faint brownish gray tinge, more marked in the costal cell and across the central crossveins; first posterior cell broadly open. Length, 17–20 mm.

Hab. Northern United States and British Possessions. I have about three dozen specimens from Fort Good Hope, Lake Athabasca, Portage and Slave Lake, Lake Winnipeg, Lake Superior (Michipicoten); Bethel, Me.; White Mts., N. H.

The antennae are sometimes black, with a trace of red at the base of the third joint only. The identification cannot be doubtful, as this is the largest among the allied species.

49. *Tabanus socius* n. sp. = ~~*epistictus* Loew~~

Female. Is very like *T. affinis*: it will be sufficient to indicate the differences. Smaller in size, being only 15–16 mm. long; the coloring of the dark portions is of a lighter gray, somewhat slate color; the second joint of the palpi is shorter and much stouter at the base, the color of the palpi is paler; antennæ of a lighter red, last joint but very little infuscated towards the end; the yellowish brown at the base of the front tibiæ is more extended here, in many specimens the tibiæ are black at the tip only; the front is distinctly coarctate anteriorly, but narrower than in *T. affinis*; the linear prolongation of the callus in most specimens forms a slightly elevated ridge, sometimes nearly reaching the ocellar tubercle. Length, 15–16 mm. I have about a dozen of specimens from the northwestern parts of the Hudson's Bay Territory (Fort Simpson, Kemnicott), agreeing in these characters; also two specimens from Illinois. All these specimens have the antealar tubercle reddish.

This species is most remarkably like the common European *T. tropicus*; however, a specimen of the latter in the Museum of Comparative Zoology, labelled by Dr. Loew, has a somewhat broader front, the antealar tubercles black, the antennæ somewhat more brownish at the tip. I sent a specimen of *T. socius* to Dr. Loew, who declared it to be different from his *T. tropicus*.

There seems to be a good deal of uncertainty connected with the European species of this group. Dr. Schiner, Fauna Austr., Diptera, I. p. 30–31, makes *tropicus* (non Linné) Loew = *solstitialis* (Meig.) Schiner; *tropicus* (Linné) Schiner = *luridus* (non Fallén) Loew; and *luridus* Fallén (non Loew) = *tropicus* Panzer. Loew observes (Verh. Zool. Bot. Ges., 1858, p. 586), in a note to the description of *T. tropicus*, that "the difficulties concerning this species are increased by the fact that there are evidently several other species yet coming in conflict here, which cannot be distinguished with certainty in single specimens." Similar difficulties probably exist among the North American species.

T. vicinus Macq., Dipt. Exot., I. I. p. 143, 44 (Carolina) apparently belongs in this relationship.

50. *Tabanus septentrionalis*.

Tabanus septentrionalis Loew, Verh. Zool. Bot., 1858, p. 593.

I translate Dr. Loew's description:

Female. Ex-cinereo nigricans, abdomine trifariam cinereo maculato, maculis lateralibus obliquis, margini postico vix contignis, tibiis obscure testaceis, oculis hirtis, trifasciatis, palpis nigropilosis, antennis nigris, frontis callo infero et linea longitudinali media atris. Long. corp. 6 lin.; long. al. 5½ lin.

“(Cinereous blackish, abdomen with three rows of cinereous spots, the lateral ones oblique, hardly touching the hind margin, tibiæ dark testaceous, eyes hairy, with three stripes, palpi with black hairs, antennæ black; frontal callosity and a longitudinal line in the middle, black; length 13 mm.)

“The great uniformity which prevails through the whole dipterous fauna in the arctic regions, and the resemblance between *T. septentrionalis* and the two preceding species,¹

¹*T. quatuorvolutus* Meig. and *nigricornis* Zett.

may serve as an excuse for my mentioning this species among those of the European fauna. It is smaller than the other two, its coloring is a darker blackish gray, with an admixture of brown. Face and front yellowish cinereous; the former, as well as the cheeks, is beset with black and pale yellowish hairs. The palpi, of a dirty whitish, are beset with black hairs, not only on the second, but also at the end of the first joint; a character especially distinctive of this species. Antennæ black, only the third joint, at the extreme basis sometimes dark reddish, the first in the shape of a cap (Kappenfoermig), and beset, as well as the second, with short black hairs; the third joint is but little excised. Front of medium breadth, with a square, shining black callosity, above which is a shining black longitudinal line, not quite connected with the callosity. Eyes strongly pubescent, with three cross-bands, which have the same position as in *T. quatuornotatus*. With the soft, pale yellowish pile on the thoracic dorsum, the pleuræ and the coxæ, many black hairs are mixed; the pollinose pale longitudinal lines on the thorax are but little apparent, the intermediate one especially is almost obsolete. The lateral spots on the abdomen are more rounded than in *T. quatuornotatus*, but in a similar position; the hind margins of the segments have a delicate, rather whitish fringe of hairs; the broad longitudinal stripe in the middle of the blackish gray venter is usually more distinct than in the related species, as the coloring of the anterior segments beside it is often reddish; when this is not the case, the stripe is hardly more apparent than in the other species. Femora black, mostly with black hairs; the extreme tip of the femora and the tibiæ yellowish brown, the latter more or less blackish at the end. Wings with a more distinct dusky tinge than in *T. quatuornotatus* and *nigricornis*, the stigma dark brown, the first posterior cell a little more coarctate at the tip than in those species."

Hab. Labrador.

1. Among the numerous specimens belonging in the vicinity of the European *T. quatuornotatus*, I have a single one, likewise from Labrador (Caribou Island, Straits of Belle Isle, A. S. Packard), which answers the above description with regard to the black hairs on the cheeks and on the first joint of the palpi; only it is a little larger (between 14 and 15 mm.).

2. Two other specimens from Labrador agree in all respects with the former; they are a little smaller, and have no black hairs on the cheeks, or on the first joint of the palpi.

3. Two specimens from Yukon River, Alaska (R. Kennicott), agree in everything with the specimen from Labrador, first mentioned, except that they have no black hairs on the cheeks and on the first palpal joint.

4. Seven specimens from Lake Winnipeg (Scudder), and five from some other localities (Massachusetts; Michipicoten, Lake Superior, Quebec, Canada), have the sides of the abdomen reddish on the first three or four segments, and the venter more or less reddish. They are more slender than the specimens from Labrador and Yukon River, and the triangles in the middle of the abdominal segments in most of them seem larger and more distinctly marked; the base of the third antennal joint is bright red in most of these specimens.

5. Three specimens from Maine (Mount Desert and the sea shore, B. P. Mann), and one from Minnesota (Scudder) are smaller than the former lot (12.5 mm.), without any reddish on the sides of the abdomen, and have the gray spots on the abdomen, both intermediate and lateral, very distinct.

Some of these groups of specimens, especially the groups 3 and 4, may really belong to different species, although I confess myself unable to characterize them as such to my own satisfaction. They all have the same characteristic comparatively narrow and hardly excised third antennal joint; nor do I perceive any appreciable difference in the shape of the front or of the palpi. Some of them even have a few black hairs on the cheeks and on the first joint of the palpi, but not nearly so distinctly as the specimen from Labrador of the group No. 1.

51. *Tabanus ilLOTUS* n. sp.

Female. Eyes pubescent: front rather broad, slightly converging anteriorly, brownish, mixed with gray, beset with black hair: callosity black, nearly square, its linear prolongation above but weakly marked, usually appearing as an ill defined oblong dark spot. Face and cheeks of a rather pure grayish white, with white hairs: palpi stout, pale yellowish, with small black hairs. Antennæ: third joint moderately broad and moderately excised, with a well marked upper angle; its color is more or less dark reddish, its distal half black. Thorax blackish, with faint gray lines, antealar tubercles usually reddish, pleuræ gray, with long, white hairs. Abdomen blackish; on the second segment two obliquely placed whitish (in rubbed off specimens pale reddish) lateral spots, not touching the hind margin (the whitish pollen and pubescence covering them reach the margin); on the third segments two much smaller and rounded spots, of the same color: on the following segments two still smaller whitish, rather faint spots, visible only in well preserved specimens, and without any reddish under them: none of these spots are in contact with the hind margin of the segment: between these lateral spots triangular intermediate spots contiguous to the hind margin are more or less visible, especially on the second and third segments. The venter is covered with a delicate white pollen and with minute whitish hairs: its ground color is black, with more or less reddish in the middle, and a blackish stripe upon it. Coxæ and femora black, with a whitish pollen and long white hairs: front tibiæ reddish yellow, black towards the tip: middle tibiæ altogether reddish, the hind tibiæ reddish brown; all the tibiæ beset with whitish hairs, the fringe of the last pair consisting sometimes of white, sometimes of black hairs, or of both mixed: tarsi brown. Wings subhyaline: faint brownish clouds on the central crossveins, at the base of the second posterior cell and on the bifurcation of the third vein: stigma brown. Length, 12-14 mm.

Hab. Fort Resolution, Hudson's Bay Territory (R. Kennicott): Yukon River, Alaska (Kennicott): Red River of the North (Scudder). I have a dozen specimens before me.

This species is easily recognized among others by the rather conspicuous spots on the second and third abdominal segments, while the spots on the following segments are smaller and much less visible. In many specimens a reddish ground color shines through the spots on the segments two and three, while it never appears on the following segments. The faint clouds on the crossveins are also a good distinguishing character.

I have two specimens from Fort Resolution, one from Lake Winnipeg (Scudder), one from Quebec (Bélanger), two from Labrador (Caribou Island, Straits of Belle Isle, A. S. Packard), one from Anticosti (Verrill), and one from Minnesota, all of which have the face and cheeks, as well as the hair upon them, somewhat yellowish, instead of pure grayish white or white; the small black hairs on the palpi are denser, especially towards the tip, making the palpi

appear darker; in one of the specimens (Quebec) there are black hairs, even on the first joint; the wings have a more distinct brownish tinge, especially the costal and the two basal cells; the underside of the body, including chest and pleuræ, is much darker, beset with blackish and yellowish, but no white hairs; on the femora also the pollen is more yellowish gray, less conspicuous, and the hairs on the front femora are black, on the hind ones yellowish; the gray spots on the third and the following segments seem to be larger. All these specimens have the subcallus denuded, black or brown, shining. In all other respects, and in general appearance, these specimens look exactly like the typical *T. illeotus*. It may be that this is a different species.

52. *Tabanus microcephalus* n. sp.

Female. Head small, in comparison to the bulk of the body; eyes pubescent; front of moderate breadth, hardly narrowed anteriorly, gray, mixed with brownish; callosity black or brown, prolonged above in a rather stout black line; vertex blackish; the black hairs on the front are short and inconspicuous. Palpi yellowish, stout at the base, tapering in a rather elongated point, clothed with short black hairs; face grayish white, with white hairs; antennæ more or less dark reddish; first joint often nearly black, with grayish pollen above, the third black towards the tip; the shape of the third joint is peculiar: it is narrow, the body of the joint is rather small, hardly excised above, thus having a blunt and but little projecting upper angle; the annulate portion is stout, the joints composing it very distinct. Thorax grayish black, with rather distinct gray lines; pleuræ gray. Abdomen rather large, in comparison to the size of the thorax, grayish black, with three distinct rows of gray spots; the spots of the intermediate series are triangular, the largest and most distinct on the second and third segments, where their apex often has a linear prolongation reaching the anterior margin of the segment; the lateral spots are oblique triangles, resting on the hind margins of the segments, and having their outer ends prolonged towards the lateral margin. Venter grayish, the reddish ground color being often visible under the gray pollen. Wings subhyaline; stigma dark brown; first posterior cell broadly open. Legs reddish brown, clothed with blackish and whitish hairs; tarsi darker; femora with gray pollen (sometimes they are dark brown). Length, 14–16 mm.

Male. I have three males before me, which, owing to the structure of their antennæ, I refer to this species. They do not materially differ from the female, except that the head is comparatively larger; the hairs on cheeks and palpi are black; the abdominal markings less distinct. The largest of the three specimens (nearly 16 mm.) has the sides of the abdomen red on segments one to four; owing to this ground color the lateral gray spots are but little apparent. In the second specimen, which is a little smaller, there is less red on the sides; in the third (about 12 mm.) the red is hardly perceptible, and the lateral gray spots are more distinct. These specimens were taken in the White Mountains, with a number of females, by Mr. Morrison.

Hab. White Mts., N. H. (Scudder and Morrison); Trenton Falls, N. Y. (in July, 1874, by myself); Massachusetts (Sanborn). I have twelve females and three males before me.

The eyes of this species have four green stripes, the two inner ones especially brilliant bluish green; intermediate spaces purple. The shape of the antennæ, and the peculiar

outline of the whole body (in the female), owing to the comparatively small head and large abdomen, will render the recognition of this species easy.

53. *Tabanus astutus* n. sp.

Female. Palpi long and narrow, not incrassated at the base, dark yellowish with black hairs; face and cheeks grayish, with a slight yellowish tinge and gray hair; front rather broad, gray; callosity large, black, almost square; above it a somewhat lanceolate black spot, almost or entirely disconnected from the callosity. Third antennal joint moderately broad, and but little excised, still with a distinctly projecting upper angle; the color is dark reddish, black towards the tip; the segments of the annulate portion very distinct. Thorax grayish black, well preserved specimens with very distinct whitish gray, partly yellowish, lines; pleuræ gray. Abdomen grayish black, with three rows of whitish triangles resting on the hind margins of the segments; the lateral ones are oblique, obtuse angular, with the outer angle prolonged towards the lateral margin. Venter grayish, with whitish incisures, an indistinct dark longitudinal stripe in the middle. Legs brown; the four hind femora on the proximal half, the tarsi and the ends of the front tibiæ dark brown, nearly black; sometimes the legs are altogether black, except the proximal half of the tibiæ, which is brownish; in such specimens the gray pollen on the femora, and grayish yellow hairs on the femora and tibiæ, are more apparent. Wings nearly hyaline; stigma brown; first posterior cell broadly open. Length, 10–13 mm.

Hab. White Mts., N. H. (near North Conway, Aug. 16, 1874, two specimens taken by me); Manlius, N. Y. (J. H. Comstock); Southington, Conn. (in July, W. H. Patton). I have six females before me.

The coloring and the markings of this species resemble *T. microcephalus* very much; but the *T. astutus* is smaller, and the general outline is different, as it has neither the small head nor the large abdomen of the former. The most striking distinctive character, however, consists in the palpi, which here are long and narrow, and not so much incrassated at the base as in *microcephalus*. The front is much broader here, and the antennæ have a more distinctly projecting upper angle. The eyes are not unlike those of *microcephalus*, only the middle stripes more green than blue; the upper one very little marked; (note taken by me from the living specimens).

The old and faded specimens, which I consider to be females of *T. cicax* (see No. 20), are not unlike this species; they differ, however, in having the eyes glabrous, and the lateral abdominal spots more distinctly angular rather than triangular, that is, in having the longest oblique side more distinctly excised in the middle; the palpi are broader and more knee-shaped at the base of the second joint; the general outline of the body is different, the thorax being comparatively longer and the abdomen narrower; the third antennal joint is somewhat broader; the anterior of the three short veins, connecting the discal cell with the margin, is straighter, not so markedly arcuate as it is in *T. astutus* and *T. microcephalus*.

The males, of course, will be easier to distinguish, that of *T. cicax* having a large head, with the large and small facets very distinctly differentiated; while the unknown male of *T. astutus* must belong to the group with the small heads and but little differentiated facets.

54. *Tabanus rhombicus* n. sp.

Female. Front comparatively broad, gray, slightly coarctate anteriorly; callosity black, with a black, shining subcallus; face whitish gray, with white hairs; palpi yellowish, stout at base, clothed with short, black hairs; antennæ more or less dark reddish, the third joint black, more or less red at base, its upper angle very shallow. Thorax grayish black with gray lines; pleuræ gray. Abdomen grayish black, with gray spots, as follows: on the second and third segments an equilateral triangle in the middle, and an oblique one on each side; the following segments show a grayish hind margin, with a fringe of grayish hair expanded into a very faint triangle in the middle, and but slightly expanded on each side, where the lateral triangles should lie; (all these markings seem to rub off very easily; especially the intermediate row of triangles, formed of hairs only, with hardly any gray pollen under them); the sides of the second segment sometimes faintly reddish. Venter blackish, with a dense gray pollen and fringes of whitish hairs; sometimes the first and second segments are faintly reddish on the sides. Femora black, with gray pollen; tibiae and tarsi reddish brown; front tibiae on their distal half and front tarsi dark brown (in some specimens the tibiae and tarsi are much darker than in others). Wings subhyaline; stigma brown; a very faint, small cloud on the bifurcation of the third vein and at the base of the second posterior cell; first posterior cell broadly open. Length, 13-15 mm.

Hab. Colorado Mountains (Lieut. W. L. Carpenter, J. Ridings). I have six specimens, only one of which can be called tolerably well preserved. Four specimens from British Columbia (Crotch) seem to belong to the same species. Two specimens from the British Possessions (Saskatchewan or Lake Winnipeg, S. H. Scudder) may perhaps also belong here; they are smaller, somewhat narrower, and the abdomen more reddish on the sides.

T. rhombicus is very like *T. microcephalus* in its general appearance, but its head is comparatively larger, the front broader, the subcallus (in all my specimens at least) is denuded, the bifurcation of the third vein shows a little cloud, which, although faint, is sufficiently distinct, the femora are darker, etc. In most specimens the ocellar tubercle is not denuded of pollen, although the eminence is plainly visible. The markings of the abdomen are very like those of *T. microcephalus*, only the triangles of the intermediate row are larger.

LIST OF THE PREVIOUSLY DESCRIBED SPECIES WHICH REMAIN UNKNOWN, UNRECOGNIZED OR DOUBTFUL;
ALL FROM NORTH AMERICA, NORTH OF MEXICO.

LINNÉ.

T. calens (Syst. Nat., p. 1000, 6) is *not giganteus* DeGeer (= *lineatus* Fab.), although quoted by DeGeer; about the confusion existing with regard to this species, see Wiedemann, Auss. Zw. I, p. 135. The name is better left in abeyance for the present.

T. crastuans (Syst. Nat., II, p. 1000, 8); see No. 10, *T. melanocerus* Wied.

FABRICIUS.

T. marginalis (Syst. Anth., 99, 31). Very doubtful species; doubtful also whether Wiedemann described the same species (compare Auss. Zw., I, p. 166); my No. 20, *T. vivax*, seems to be the nearest to it.

PALISOT-BEAUVOIS.

T. ferrugineus (Tab. III, f. 2, p. 221).

T. nebulosus (Tab. III, f. 4, 5, p. 222).

T. pallidus (Tab. III, f. 3, p. 100).

T. palpinus (Tab. III, f. 1, p. 221).

I cannot make out these species.

WIEDEMANN.

- T. annulatus* Say. (Auss. Zw., I, p. 185). Certainly not among the species of which I have specimens.
T. gracilis (Auss. Zw., I, p. 156, 71, Georgia) unknown; see *T. tener* O. S. No. 11.
T. nigripes (Ibid., p. 142, 50); see No. 13, *T. coffeatus* Macq.

MACQUART.

- T. baltimorensis* (Dipt. Exot., 5^e Suppl., p. 34; Baltimore). Perhaps *T. costalis* Wied.?
T. bicolor (Ibid., 2^e Suppl., p. 21; South Carolina). Perhaps *T. giganteus* DeGeer, female? Compare this species (No. 37).
T. casiofasciatus (Ibid., 5^e Suppl., p. 32; Baltimore). Perhaps *T. giganteus* DeGeer, male? See this species (No. 37).
T. carolinensis (Ibid., I, 1, p. 145; Carolina); belongs in the group of *T. socius*, or perhaps of *T. microcephalus*, *astutus*, etc.?
T. cingulatus (Ibid., I, 1, p. 144, 46; Philadelphia). I do not recognize this species.
T. dorsonotatus (Ibid., 2^e Suppl., p. 22; Carolina; a male). May be the male of *T. rufus* Pal. No. 34, which I have not seen?
T. fuscomacrosus (Ibid., I, 1, p. 147, 42; no locality; Walker, List, etc., I, p. 149, has it from Florida). May be *T. turbidus* Wied. No. 1.
T. hirticollatus (Ibid., 5^e Suppl., p. 33, 128; Baltimore; a male). *Eyes pubescent*. I do not know this species. The words "antennes . . . à dent un peu allongée," may betray the male of my *T. cerastes* No. 42.
T. nimus (Ibid., 1^{re} Suppl., p. 42, 88; Texas); see my *T. psammophilus* No. 18; the name is preoccupied by Wiedemann.
T. Nova Scotia (2^e Suppl., p. 24, 110). Unrecognizable.
T. punctipennis (2^e Suppl., p. 23, 108; Philadelphia). Agrees exactly with *T. lusiophthalmus* No. 47, except that the pubescence of the eyes is not mentioned. In any case the name must be given up, as there is an earlier *T. punctipennis* by Macquart himself; Dipt. Exot., I, 2, p. 185.
T. vicinus (Ibid., I, 1, p. 143, 44; Carolina); of the group of my *T. socius* No. 49.
T. unicolor (Ibid., 2^e Suppl., p. 22, 107; Carolina). I do not know this species. There is a much earlier *T. unicolor* Wied.

RONDANI.

- T. cheliopertus*. I transcribe the rather inaccessible description. (Female.) *Oculi* nudi. *Antennæ* superne in dentem non extensæ, fulvæ. *Palpi* fulvescentes. *Frons* rufa. *Facies* sordide albicans. *Thorax* dorso fulvo-rubescens, pleuris paulo griseocentibus. *Scutellum* fulvo-rubescens, margine paulo griseo. *Abdomen* fulvo-rubescens, segmentis penultimo et præcedente in medio paulo fuscis; omnibus lineola marginali postica, parum manifesta, sublutescente. *Squamæ* et *halteres* fulvescentes. *Pedes* fulvo-rufi, tarsis vix obscurioribus, et geniculis angustissime lutescentibus. *Ala* paulo infuscata, circa venas aliquantulum fusco-lutescentes, ad venarum conjunctiones fusco-nigricantis (*sic*) maculata. *Stigmata* et *costa* anguste fusco-lutea. Longit., millim. 18. Carolina. (Nuovi Annali di Sc. Nat. di Bologna, Sept.-Oct., 1850.)

I do not know this species.

WALKER.

- T. comes* (List, etc., I, p. 172. *T. insecitus*; changed into *T. comes*, Ibid., V, p. 173; Hudson's Bay Terr.; Nova Scotia). The author describes a specimen without head. I find in my notes that when, in 1859, I visited the British Museum, *T. comes* was represented in it by five specimens, belonging to three different species, all of them of the difficult groups of *T. marginalis* Wied., or *T. illotus* O. S.
T. confusus (List, etc., I, p. 147; Georgia).
T. imitans (List, etc., I, p. 146; Georgia).
 Both of the group of *T. abdominalis*; perhaps this very species.
T. contrarius (Dipt. Saunders., p. 24; United States). The description of the abdomen suggests *T. costalis*; but the thorax is said to be gray, with hoary hairs.
T. dricatus (List, etc., I, p. 151; North America). Walker says he describes a male; in the British Museum I saw a single female specimen, which, at that time, I did not recognize. The description suggests nothing to me now, and is rather unmeaning. There is some confusion in the Latin diagnosis, where in the third line, *nigris* must, I suppose, be read instead of *fulvis*.

- T. duplex* (List, etc., I, p. 173, *T. imitans*; name changed, *ibid.*, V, p. 173; Hudson's Bay Territory). I cannot identify it.
- T. frontalis* (List, etc., I, p. 172; Nova Scotia). Said to be allied to No. 48, *T. affinis* Kirby, but will be difficult to identify from the description.
- T. fulvifrons* (List, etc., I, p. 181; Illinois). In the British Museum a single very bad and indistinct specimen. The description is absolutely unmeaning.
- T. incisus* (Dipt. Saund., p. 26; Cape Breton). Unknown; the abdomen must be somewhat like that of *T. linola*.
- T. intermedius* (List, etc., I, p. 173; Hudson's Bay Territory; male and female). Unknown.
- T. leucomelas* (List, etc., I, p. 175; Georgia). Description very unmeaning; in coloring it seems to be like my *T. socius*, or like *T. vicinus* Macq.
- T. mutatus* (Dipt. Saund., I, p. 23; United States). The description suggests *T. costalis* Wied., or some species closely resembling it, but larger.
- T. patulus* (List, etc., I, p. 175; Georgia). I do not know this species.
- T. procerus* (List, etc., I, p. 147; Florida) is ten lines long; very probably described from an unrecognizable specimen of some well known species.
- T. recedens* (List, etc., I, p. 147; Florida). Must be like my No. 5, *T. catenatus*, perhaps the same.
- T. rufifrons* (Dipt. Saunders, I, p. 26; Georgia). Very incomplete description, perhaps my No. 13, *T. tenuis*.
- T. scitus* (List, etc., I, p. 181) comes nearest to my No. 42, *T. crassus*, on account of the structure of the antennae; in other respects the description is unmeaning.
- T. triligatus* (List, etc., V, p. 183; Arctic America); apparently a somewhat smaller specimen of No. 48, *T. affinis* Kirby. The description of antennae and palpi, and of the brownish coloring, excludes the synonymy of No. 49, *T. socius*.

ADDITIONS TO PART I OF THE PRODROME OF THE TABANIDE OF THE UNITED STATES.

Chrysops pulicus (page 381). Three female specimens from Ft. Capron, Florida, April 11, 12 (collected by Messrs. Hubbard and Schwartz), do not seem to differ from my other specimens; only the distal margin of the cross-band of the wing is straighter, and not slightly sinuate in the third posterior cell, as I find it in my typical specimens.

Two females from Sag Harbor, Long Island (caught by myself in July, 1875), have an altogether black frontal callosity; the coloring of the body and wings is darker and more, intense, and the outlines of the abdominal spots and the design of the wings are better defined. In other respects the agreement with the typical specimens is perfect.

Chrysops morosus (page 389). Three females and a male from Florida (Cedar Keys, June 4; Ft. Capron, April 9; Indian River, April) do not show any trace of yellow abdominal stripes, and agree in this respect with the specimens mentioned in Part I, p. 390. I think now that such specimens belong to *C. morosus*, which would in this case occur as often with as without yellow stripes on the abdomen. I also feel more inclined now than before, to identify this species with *C. luyens* Wied.

Chrysops frigidus, female (page 384). Varieties occur in which the red of the abdomen prevails at the expense of the black. An extreme case of this kind was communicated to me by Mr. Dimmock, in which even the facial callosities were reddish. In this specimen the second segment was altogether reddish, except a small subtriangular spot in the middle; the two following segments were blackish along their anterior margin only; the last three segments, although black, were laterally and posteriorly margined with yellow. For

such exceptional specimens the analytical table of course cannot serve. Mr. Dinmock had seen a male, and I now entertain no doubt that the two sexes, as described by me, belong together.

Diabasis (page 396). In preparing the first part of this paper I had neglected to search the title to priority of the genus *Diabasis*. I find now that the name is preoccupied by Hoffmannsegg in Wiedemann's Zoolog. Magazin, I. 1, p. 14, 1817, for a group of *Ratelle* (Coleoptera). The genus is also accepted in Harold and Gemminger's Catalogue. For the Tabanid I propose therefore the name *Diachlorus* which means striped with green in allusion to the color of the eyes.

LIST OF THE DESCRIBED TABANIDÆ FROM MEXICO, CENTRAL AMERICA AND THE WEST INDIES.

PANGONIA.

- aurulans** Wiedemann, Auss. Zw., II, p. 620, 12. Mexico.
atrifera Walker, Trans. Ent. Soc., N. S., V, p. 272. Mexico.
flavohirta Bellardi, Saggio, etc., I, p. 49. Mexico.
fulvithorax Wiedemann, Auss. Zw., I, p. 89; Bigot, in R. de la Sagra, etc., p. 797. Brazil (Wied.); Cuba (Bigot).
incerta Bellardi, Saggio, etc., I, p. 52. Mexico.
nigronotata Macquart, Dipt. Exot., 1^{re} Suppl., p. 27, 56; Tab. II, f. 5; Bellardi, Saggio, etc., I, p. 51. Mexico.
planiventris Macquart, Dipt. Exot., 4th Suppl., p. 26, 55. Mexico.
rhinophora Bellardi, Saggio, etc., I, p. 46; Tab. II, f. 1. Mexico.
restrifera Bellardi, Saggio, etc., I, p. 47. Mexico.
Sallei Bellardi, Saggio, etc., I, p. 50. Mexico.
Saussurei Bellardi, Saggio, etc., I, p. 49, Tab. II, f. 4. Mexico.
semiflava Wiedemann, Auss. Zw., II, p. 622, 16; Bellardi, Saggio, etc., I, p. 51, Tab. II, f. 2. Mexico.
tenuirostris Walker, Trans. Ent. Soc., N. S., V, p. 272. Mexico.
Wiedemanni Bellardi, Saggio, etc., I, p. 48, Tab. II, f. 3. Mexico. *T. basilaris* Wiedemann, Auss. Zw., II, p. 621.

LEPIDOSELAGA.

- lepidota** Wiedemann, Auss. Zw., I, p. 193 (*Tabanus*); Perty, Delectus, etc., p. 183, Tab. XXXVI, f. 9 (*Hulcus*); Macquart, Dipt. Exot., I, 1, p. 154, Tab. XVIII, f. 3; Bellardi, Saggio, etc., I, p. 75 (*Hulcus*); according to Loew, Centur., VIII, 8, only the female described by Bellardi, belongs here. Brazil, Guyana (Macquart, Perty); Mexico (Bellardi). *Hemitepota crassipes* Fabricius, Syst. Anth., p. 108, 4. (Synonymy after Loew, l. c.)
recta Loew, Centur., VIII, 8. New Granada; Mexico. *Hulcus lepidotus* Bellardi, Saggio, etc., I, p. 75; *nuda*. (Synonymy after Loew, l. c.)

DICHELACERA.

- fasciata** Walker, Dipt. Saund., I, p. 68. North America.
abiens Walker, List, etc., I, p. 191. West Indies.
scapularis Macquart, Dipt. Exot., 2^e Suppl., p. 15, 9. Mexico.

CHIRYSOPS.

- gigantulus** Loew, Centur., X, 12. California.
affinis Bellardi, Saggio, etc., I, p. 70, Tab. II, f. 14. Mexico.
apicalis Bellardi, l. c., p. 73. Mexico.

- crucians** Wiedemann, Auss. Zw., I, p. 211. Brazil (Wied.); Cuba (Jaenicke, Neue Exot. Dipt., p. 4).
- costatus** Fabricius, Ent. Syst., IV, p. 373, 45 (*Tabanus*); Syst. Anth., p. 112, 8; Palisot, Ins., Dipt., p. 22, Tab. III, f. 7; Wiedemann, Dipt. Exot., I, p. 104, 4; Auss. Zw., I, p. 198, 5; Macquart, Dipt. Exot., I, p. 160, 8; Bigot, R. de la Sagra, etc., p. 798; Guérin, Iconogr., Texte, III, p. 542, Tab. XCVII, f. 3 (called *C. molestus* on the plate). S. America (Fabr.); Cuba (Macq.); Jamaica (Walk.). *Tabanus variegatus*, DeGeer, Tab. XXX, f. 7. (The synonymy is very probable.)
- frontalis** Macquart, Dipt. Exot., I, I, p. 160, 7. West Indies.
- geminatus** Wiedemann, Auss. Zw., I, p. 205, 16; Macquart, Dipt. Exot., 4^e Suppl., p. 39. Patria ignota, (Wied.); Mexico (Macq.).
- inornatus** Walker, List, etc., I, p. 198. West Indies, Brazil.
- lateralis** Wiedemann, Auss. Zw., I, p. 209, 21; Walker, List, etc., I, p. 200; V, p. 288. Patria ignota (Wied.); Honduras (Walk.).
- latifasciatus** Bellardi, Saggio, etc., I, p. 71, Tab. II, f. 15. Mexico.
- megaceras** Bellardi, l. c., p. 74; Tab. II, f. 18. Mexico.
- pallidus** Bellardi, l. c., p. 73, Tab. II, f. 16. Mexico.
- scalaratus** Bellardi, l. c., p. 72, Tab. II, f. 19. Mexico.
- subcæcutiens** Bellardi, l. c., p. 69, Tab. II, f. 13. Mexico.
- virgulatus** Bellardi, l. c., p. 71, Tab. II, f. 17. Mexico.

TABANUS.

- albiscutellatus** Macquart, Dipt. Exot., 4^e Suppl., p. 34, Tab. II, f. 9. Mexico.
- albonotatus** Bellardi, Saggio, etc., I, p. 56, Tab. II, f. 5.¹ Mexico; Tampico.
- alteripeunis** Walker, Trans. Ent. Soc. N. Ser., V, p. 274. Mexico.
- aurantiacus** Bellardi, Saggio, etc., I, p. 67; Tab. II, f. 9. Mexico.
- Bigoti** Bellardi, Saggio, etc., I, p. 59. Mexico.
- Syn.* - **apicalis** Macquart, Dipt. Exot., 2^e Suppl., p. 20; Walker, List, etc., V, p. 188.
- bipartitus** Walker, List, etc., I, p. 158. Honduras.
- caliginosus** Bellardi, Saggio, etc., I, p. 68, Tab. 22, f. 10. Mexico.
- carneus** Bellardi, Saggio, etc., I, p. 62. Mexico.
- circumfusus** Wiedemann, Auss. Zw., II, p. 624, 21. Mexico.
- commixtus** Walker, Trans. Ent. Soc., N. Ser., V, p. 273. Mexico.
- completus** Walker, List, etc., I, p. 185. St. Thomas.
- Craverii** Bellardi, Saggio, etc., I, p. 60. Mexico.
- De filippii** Bellardi, Saggio, etc., I, p. 57. Mexico.
- dorsifer** Walker, Trans. Ent. Soc., W. Ser., V, p. 273. Mexico.
- ferifer** Walker, Dipt. Saund., I, p. 30. West Indies.
- flavo-cinctus** Bellardi, Saggio, etc., I, p. 61. Mexico.
- lucidulus** Walker, List, etc., I, p. 188. Jamaica.
- luteo-flavus** Bellardi, Saggio, etc., I, p. 60. Mexico.
- longiappendiculatus** Macquart, Dipt. Exot., 5^e Suppl., p. 32, 125. Honduras.
- nigro-punctatus** Bellardi, Saggio, etc., I, p. 67, Tab. II, f. 8. Mexico.
- obliquus** Walker, Dipt. Saund., I, p. 28. West Indies.
- propinquus** Bellardi, Saggio, etc., I, p. 65. Mexico.
- purus** Walker, Trans. Ent. Soc., N. Ser., V, p. 274. Mexico.
- quinquevittatus** Wiedemann, Dipt. Exot., I, 84, 39; Auss. Zw., I, p. 173, 93; Bellardi, Saggio, etc., I, p. 65. Mexico.
- oculus** Walker, List, etc., I, p. 197. Honduras, Columbia.

¹This species has the first posterior cell closed, and petiolate at the distal end. Mr. Rondani (Diptera exotica revisa et annotata, etc., Modena, 1863, p. 81, fig. 12, 13) proposes for this species the establishment of a new genus *Bellardia*,

which would also include Macquart's species *T. maculipennis*, *clausus*, *limbatinervis*. The genus, however, cannot be maintained.

- parallelus** Walker, List, etc., I, p. 187. West Indies.
parvidentatus Macquart, Dipt. Exot., I, I, p. 149; Walker, List, etc., V, 189. West Indies.
rubescens Bellardi, Saggio, etc., App., p. 15. Mexico.
rufiventris Macquart, Dipt. Exot., I, I, p. 141, 39; Walker, List, etc., I, p. 189; Bigot, R. de la Sagra, p. 798. Cuba, Jamaica.
Sallei Bellardi, Saggio, etc., I, p. 61, Tab. II, f. 7. Mexico.
stigma Fabricius, Syst. Anth., p. 104, 59; Wiedemann, Dipt. Exot., I, 92, 53; Auss. Zw., I, p. 180, 104. South America and St. Thomas.
subsimilis Bellardi, Saggio, etc., I, p. 66. Mexico.
subtilis Bellardi, Saggio, etc., I, p. 55. Mexico.
subruber Bellardi, Saggio, etc., I, p. 55. Mexico. *ruber* Macquart, Dipt., Exot., 2^e Suppl., p. 42; Walker, List, etc., V, p. 188.
Sumichrasti Bellardi, Saggio, etc., I, p. 56. Mexico.
tinctus Walker, Dipt. Samol., I, p. 29. West Indies.
trilineatus Latreille, Hamb. et Bompl. Rec. d'Obs. de Zool., fasc. X, p. 116, 117, Tab. XI, f. 6; Wiedemann, Dipt. Exot., I, p. 84; Auss. Zw., I, p. 168; Walker, List, etc., V, p. 217; Bellardi, Saggio, etc., I, p. 63. Mexico.
Truquii Bellardi, Saggio, etc., I, p. 64, Tab. II, f. 6. Mexico.

INDEX.

Atylotus, subgen. nov., II, 425.

Chrysops, I, 369.

æstuans v. d. Wulp., I, 378.
affinis Bell., II, 475.
apicalis Bell., II, 475.
approximans Walker, I, 396.
ater Macq., I, 375.
areolatus Walk., I, 390.
atropos O. S., I, 372.
canifrons Walk., I, 385.
callidus O. S., I, 379.
carbonarius Walk., I, 375, 377.
celer O. S., I, 376.
convergens Walk., I, 396.
costatus Fabr., II, 476.
crucians Wied., II, 476.
delicatulus O. S., I, 380.
divisus Walk., I, 372.
excitans Walk., I, 373.
fallax O. S., I, 392.
fascipennis Macq., I, 387.
ferrugatus Fab., I, 396.
flavidus Wied., I, 385.
frigidus O. S., I, 384, II, 474.
frontalis Macq., II, 476.
fugax O. S., I, 375.
fuliginosus Wied., I, 393.
fureatus Walk., I, 391.
geminatus Wied., II, 476.
gigantulus Loew, II, 476.
hilaris O. S., I, 391.
inornatus Walk., II, 476.
indus O. S., I, 383.

Chrysops *lateralis* Wied., II, 476.

luteofasciatus Bell., II, 476.
lineatus Jaennicke, I, 390.
lugens Wied., I, 394.
megaceus Bell., II, 476.
nitidus O. S., I, 374.
nocturnus O. S., I, 387.
nocturnus Walk., I, 378.
montanus O. S., I, 382.
morosus O. S., I, 389, II, 474.
niger Macq., I, 377.
niger Walk., I, 376.
nigripes Zett., I, 394.
obsoletus Wied., I, 393.
pallidus Bell., II, 476.
plangens Wied., I, 393.
provocans Walk., I, 374.
radicus O. S., I, 381, II, 474.
quadrivittatus Say, I, 395.
scalaratus Bell., II, 476.
sepulchralis Kirby, I, 395.
sordidus O. S., I, 376.
striatus O. S., I, 391.
subceuticus Bell., II, 476.
trinitatus Macq., I, 389.
univittatus Macq., I, 387.
variegatus DeGeer, II, 476.
virgulatus Bell., II, 476.
vittatus Wied., I, 390.
vittatus Bell., I, 391.

Diabasis I, 396, II, 474.

ferrugata, I, 396.

atenea, I, 396.

- Diachlorus*, H., 475.
 ferrugatus, H., 475.
Dichelacera, H., 475.
 ferrugata, I., 396.
 abiens Walk., H., 475.
 scapularis Macq., H., 475.
Hammotopota I., 395.
 americana O. S., I., 395.
 pluvialis, I., 396.
 punctulata Macq., I., 395.
 crassipes Fabr., H., 475.
Hadrus lepidotus Perty, H., 475.
Lepidoselæga, H., 475.
 lepidota Wied., H., 475.
 recta Loew, H., 475.
Pangonia I., 395.
 annulans Wied., H., 475.
 atrifera Walk., H., 475.
 basilaris Wied., H., 475.
 chrysocoma O. S., I., 368.
 flavohirta Bell., H., 475.
 hulvithorax Wied., H., 475.
 fistiformis Walk., I., 366.
 incerta Bell., 475.
 incisa Wied., I., 366.
 macroglossa Westw., I., 368.
 nigronotata Macq., H., 475.
 pigra O. S., I., 367.
 planiventris Macq., H., 475.
 rhinophora Bell., H., 475.
 rasa Loew, I., 366.
 rostrifera Bell., H., 475.
 Sallei Bell., H., 475.
 Saussurei Bell., H., 475.
 semiflava Wied., H., 475.
 tennirostris Walk., H., 475.
 tranquilla O. S., I., 367.
 Wiedemanni Bell., H., 475.
Silvius, I., 395.
 isabellinus Wied., I., 395.
 trifolium O. S., I., 395.
Tabanus, H., 421.
 abdominalis Fab., H., 431. *Supp.*
 abiens Walk., H., 475.
 Acteon O. S., H., 413.
 affinis Kirby, H., 466.
 albiscutellatus Macq., H., 476.
 albonotatus Bell., H., 476.
 alteripennis Walk., H., 476.
 americanus Drury, H., 451.
 americanus Forst., H., 457.
 americanus Pal. Beauv., I., 396.
 annulatus Say, H., 473. *Wied. Supp.*
 apicalis Macq., H., 476.
 astutus O. S., H., 471.
 ater Pal. Beauv., H., 456.
 ater Wied., H., 455.
 atratus Fabr., H., 451.
 aurantiacus Bell., H., 476.
 baltimorensis Macq., H., 473.
 bicolor Macq., H., 458, 473.
 bicolor Wied., H., 460.
 Bigotii Bell., H., 476.
 bipartitus Walk., H., 476.
 caesiofasciatus Macq., H., 458, 473.
 calens Linn., H., 472.
 caliginosus Bell., H., 476.
 carneus Bell., H., 476.
 carolinensis Macq., H., 473.
 catenatus Walk., H., 433.
 cerastes O. S., H., 462.
 cheilepterus Rondani, H., 473.
 cinctus Fab., H., 461.
 cingulatus Macq., H., 473.
 circumfusus Wied., H., 476.
 coffentus Macq., H., 441.
 comes Walk., H., 473.
 commixtus Walk., H., 476.
 completus Walk., H., 476.
 confusus Walk., H., 473.
 conterminus Walk., H., 473.
 costalis Wied., H., 459.
 costatus Fab. (Chrysops). II, 476
 ~~*crassipes* Wied.~~
 Craverii Bell., H., 476.
 cymatophorus O. S., H., 444.
 de Filippii H., 476.
 derivatus Walk., H., 473.
 dorsonotatus Macq., H., 473.
 dorsifer Walk., H., 476.
 duplex Walk., H., 471.
 endimion O. S. - *supplement.*
 erythrotelus Walk., H., 461.
 epitriptus O. S. - *supplement.*
 exilis Linn., 440, 472.
 exul O. S. - *supplement.*
 fasciatus Walk.
 ferrifer Walk., H., 476.
 ferrugatus Wied., I., 396.
 ferrugineus Pal. Beauv., H., 472.
 flavipes Wied., H., 462.
 flavocinctus Bell., H., 476.
 flavus Macq., H., 459.
 frontalis Walk., H., 474.
 fronto O. S., H., 431.
 fulvifrons Macq., H., 437.
 fulvescens Walk., H., 460.
 fulvifrons Walk., H., 471.
 fulvulus Wied., H., 451.
 fumipennis Wied., H., 456.
 fuscoerivorus Macq., H., 473.
 fusco-punctatus Macq., H., 432. *Supp.*
 gigantens DeGeer, H., 458.
 gracilis Wied., H., 473.
 hirtiocularis Macq., H., 473.
 illotus O. S., H., 469.
 imitans Walk., H., 473.
 inanis Fab., H., 459.
 incisus Walk., H., 471.
 intermedius Walk., H., 474.
 lasiophthalmus Macq., H., 465.
 lepidotus Perty (Lepidoselæga), H., 475.
 leucomelas Walk., H., 474.

- Tabanus* *limbatus* Pal. Beauv., II, 457.
lineatus Fab., II, 458.
lineola Fab., II, 448.
longiappendiculatus Macq., II, 476.
longus O. S., II, 447.
lucidulus Walk., II, 476.
lugubris Macq., II, 456.
luteolivus Bell., II, 476.
marginalis Fab., II, 446, 472.
Megerlei Wied., II, 457.
melanocerus Wied., II, 449.
mexicanus Lin., II, 479.
microcephalus O. S., II, 470.
modestus Say, II, 438, 476.
mutatus Walk., II, 471.
nanus Macq., II, 473.
niger Pal. Beauv., II, 454.
nebulosus Pal. Beauv., II, 472.
nigrescens Pal. Beauv., II, 453.
nigripes Wied., II, 441, 473.
nigropunctatus Bell., II, 476.
nigrovittatus Macq., II, 449.
nivosus O. S., II, 445.
notabilis Walk., II, 465.
Novæ Scotiæ Macq., II, 473.
obliquus Walk., II, 476.
ochroleucus Meig., II, 459.
oculus Walk., II, 476.
olivaceus Deg., II, 459.
Orion O. S., II, 442.
pallidus Pal. Beauv., II, 472.
palpinus Pal. Beauv., II, 472.
parallelus Walk., II, 476.
parvidentatus Macq., II, 470.
patulus Walk., II, 474.
plumbeus Drury., II, 457.
propinquus Bell., II, 476.
proximus Walk., II, 474.
psammophilus O. S., II, 445.
pumilus Macq., II, 448.
punctatus Fab., II, 459.
punctifer O. S., II, 453.
punctipennis Macq., II, 473.
purus Walk., II, 476.
quinque-lineatus Macq., II, 439.
quinque-vittatus Wied., II, 476.
recedens Walk., II, 474.
Reinwardtii Wied., II, 461.
rhombicus O. S., II, 472.
- Tabanus* *Rondanii* Bell., I, 396.
ruber Macq., II, 477.
rubescens Bell., II, 477.
ruficeps Macq., II, 460.
ruficornis Fab., II, 457.
rufiventris Macq., II, 477.
rufifrons Walk., II, 474.
rufus Pal. Beauv., II, 456, ^{Supp}.
sagax O. S., II, 452.
Sallei Bell., II, 477.
scapularis Macq., II, 475.
seitus Walk., II, 474.
scutellaris Walk., II, 448.
septentrionalis Loew, II, 467.
simulans Walk., II, 448.
socius O. S., II, 467. = *epistatus* O. S.
stigma Fab., II, 477.
stygius Say., II, 451.
subsimilis Bell., II, 477.
subtilis Bell., II, 477.
subruber Bell., II, 477.
sulcifrons Macq., II, 437.
sulphureus Pal. Beauv., II, 459.
Sumichrasti Bell., II, 477.
tarandi Walk., II, 463.
Terre Novæ Macq., II, 463.
tectus O. S., II, 436.
tener O. S., II, 440.
tinctus Walk., II, 477.
trijunctus Walk., II, 432.
triligatus Walk., II, 474.
trilineatus Latr., II, 477.
triherculatus Pal. Beauv., II, 439.
trispilus Wied., II, 464.
Trumpii Bell., II, 477.
turbidus Wied., II, 439.
unicolor Macq., II, 473.
validus Wied., II, 454.
variegatus DeGeer (see *Chrysops*).
variegatus Fab., II, 437.
venustus O. S., II, 444.
vicarius Walk., II, 459.
vicinus Macq., II, 473.
viridilavus Walk., II, 459.
vivax O. S., II, 446.
Wiedemanni O. S., II, 455.
zonalis Kirby, II, 463.
- Therioptectes*, subgen. *Zell.*, II, 425.

Supplement

to Prodrôme of a Monograph of the Tabanidae of the United States.

Read Nov. 15, 1876 - C.R. Osten Sacken.

Notes.

1. *Tabanus socius* O.S. = *Tepistates* O.S.

2. *Tabanus annulatus* Wd. Female: Eyes glabrous; frontal callosity unusually small; thorax whitish pruinose; abdomen brown, hind margins of segments whitish pruinose & beset with white hairs; wings immaculate. Length, 12-13 mm.
Front rather narrow, yellowish brown, with a ridge-like line in middle whose ^{light} expansion represents the very narrow, almost linear, frontal callosity, which occupies less than $\frac{1}{2}$ breadth of front; ant. reddish; 3d joint rather broad, upper corner angular, projecting; its annulate portion rather long & with very distinct divisions; palpi rather narrow at base & adjacent yellowish white with short, black hairs; face white with white hairs. Thorax densely covered with whitish pollen, & clothed with recumbent white hairs. Abdomen brownish; hind margins of segments with rather broad whitish pruinose bands beset with white hairs; front coxae yellowish white, with white pile; front femora, tips of tibiae & tarsi brown; basal three quarters of the tibiae whitish, beset with white pile; the fore posterior tibiae likewise yellowish white, except their extreme tip, which is infuscated; post. tarsi brownish, paler at basis. Wings slightly grayish, unicolorous; first post. cell broadly open. Hab. Missouri (Say); Cumberland Gap (Dimmock); Ga. (Morrison); Kansas (J. F. Gaumer).
3 Females.

This singular sp. will be easily recognized, especially by the smallness of the frontal callosity. On the vertex there is a distinct tubercle, & if this is the ocellar tubercle it would be, to me at least, the first instance of its presence in a species with glabrous eyes.

3. *Tabanus endymion*, n. sp. Male: Thorax brown, whitish anteriorly, scutellum white; abdomen chestnut brown, segments with broad white margins. fork of 3rd vein & crossveins at the base of posterior cells (except the third), spotted with brown. Length, 15-16 mm.
Female: Thorax grayish brown, with grayish lines; abdomen brown, posterior margins of segments white, expanding into large triangles in the middle; fork of third vein & crossveins at the base of all posterior cells spotted with brown. Length 16-17 mm.
Hab. Ga. (H. K. Morrison) 2 ♂♂ & 2 ♀♀.

Great diff. bet. sexes partic. in color of thorax & scutellum. The ♂ is a remarkably handsome insect; the ♀ has a superficial resemblance to smaller spms of remwardtii, but is easily recognized by absence of the lateral white spots on abdomen.

11

4. *Tabanus exul*, n. sp. First posterior cell open, altho strongly coarctate at the end; front (♀) broad frontal callosity of the corresponding breadth. Length ♀ 18-22 mm; ♂ about 20 mm.

♀ Differs from *abdominalis* in much less rufous abdominal coloring & has on segments 2-5 well marked elongated yellowish white ~~Δ~~ which do not reach anterior margin of the segment. Fringe of hairs on hind ~~segments~~ tibiae altogether black & not containing red in its upper portion. 2nd ant. joint narrower.

Hab. D.C., Md., Pa., N.J.

the synonyms of *palivost* & *Wd.* most probably belong to *exul*. On p. 436, line 3 from bottom, & on p. 437, line 18 from top, read *T. exul* for *T. abdominalis*.

the analyt table on 428 will read thus:

- | | | |
|-----|--|-----------------------------|
| 10 | { First post. cell closed; front remarkably narrow | 6. <i>abdominalis</i> Fabr. |
| | { First post cell open. | - 10 a |
| 10a | { Head of ♂ subhemispherical; in ♀ abdom. triangles are of moderate size | |
| | { Head of ♀ differing but little from ♀'s; abdominal triangles large & broad | 6a. <i>exul</i> n. sp |

7. *tectus* n. sp.

5. *Tabanus abdominalis* Redescribed: First post. cell ~~closed~~; front narrow, frontal callosity narrow, elongated. Length 18-22 mm.

Female: Face pale yellowish gray, pale hairs on cheeks; palpi black; front narrow, yellowish gray mixed with brownish. frontal callus narrow, much longer than broad, black or dark brown; a linear prolongation above; basal joints of ant. very dark, clothed with short black pile; 2d joint red, rather broad, with a rectangular projecting upper angle; annulate portion generally darker, brownish. Thorax brownish gray, with alternate gray lines & darker stripes; the former clothed with short, golden yellow hairs. Pleurae of a dingy yellowish gray, with hairs of the same color, a tuft of black pile in the middle, & a fringe of such pile bet. the humeral & root of wings. Abdomen rufous; second seg. with a ill-defined, black, cloud-like spot anteriorly, in the middle; similar black shades of variable extent on the following segments, so that on segments 4, 5 & 6, the ant. two-thirds of the segments are often blackish brown, leaving a rufous post. border, which is broader laterally; the black regions are clothed with short black pile, the rufous ones with reddish golden pile; a faint reddish yellow triangle usually visible in the middle of the hind margin of second segments; it is still less distinct, often obsolete, on the following segments. Venter uniformly yellowish rufous; last segment with some black pile.

Legs black, basal portion of tibiae red to a greater or lesser extent; hind tibiae with a fringe of hairs which is red above & black below. Wings tinged with brown, more saturate along veins; a distinct brown cloud on bifurcation of third vein; paler clouds on crossveins; first post. cell closed.

Hab. Kentucky (J. Dimmock); Ga. (H. K. Morrison) nineteen females.

Reasons for believing this is *Tabanus abdominalis* p. 434

PUBLICATIONS OF THE BOSTON SOCIETY OF NATURAL HISTORY.

JOURNAL.

Vol. I, part 2, \$2.00; part 3, \$1.50.

" II, \$6.50; Vol. II, part 1, \$2.00; part 2, \$2.00; parts 3-4, \$3.00.

" IV, part 2, \$1.50; part 3, \$1.50; part 4, \$1.50.

Vol. V, part 1, \$1.75.

" VI, \$6.00; Vol. VI, part 1, \$1.75; part 2, \$1.50; part 3, \$1.75; part 4, \$1.25.

" VII, part 2, \$1.75; part 3, \$1.50; part 4, \$1.25.

PROCEEDINGS (bound).

Vols. II, III, IV, VI, VII, per volume, \$2.50.

Vol. VIII, \$2.75.

" IX, \$3.50.

Vols. X-XVII, per volume, \$3.50 to members, \$4.50 to the public.

Vol. XVIII, now issuing in quarterly parts, \$3.00 to members; \$4.00 to the public.

MEMOIRS.

Vol. I, parts 1, 2, 3, and 4, each \$3.50 to members, \$4.00 to the public.

" II, issued in illustrated parts of quarto size, averaging

130 pages annually, \$3.50 per part to members, \$4.00 to the public.

SEPARATE MEMOIRS OF VOL. II.

PART I.

Volcanic Manifestations in New England. By Wm. T. Brigham, A.M. pp. 28. 50 cents.

Early Stages of Terebratulina. By Prof. Edward S. Morse. Two Steel Plates. pp. 12. \$1.00.

Osteology and Myology of Didelphys virginiana. By Elliot Cones, M.D., U.S.A. With an Appendix on the Brain. By Jeffries Wyman, M.D. pp. 114. \$2.50.

PART II.

Development of Limulus Polyphemus. By A. S. Packard, Jr., M.D. Three Steel Plates. pp. 48. \$2.00.

Description of the Balanoptera musculus, in the possession of the Society. By Thomas Dwight, Jr., M.D. Two Plates. pp. 28. \$1.25.

Fossil Myriapods from Nova Scotia. By S. H. Scudder. 35 cents.

Note additionnelle au Mémoire intitulé "Volcanic Manifestations in New England." Par M. Albert Lancaster. 35 cents.

PART III.

Embryology of Terebratulina. By Prof. E. S. Morse. Two Steel Plates. \$1.00.

List of the Birds of Western Mexico, by George N. Lawrence; with Notes on their Habits, etc., by Col. A. J. Grayson. \$1.25.

Recent changes of Level on the Coast of Maine. By Prof. N. S. Shaler. pp. 20. 40 cents.

The Species of the Lepidopterous Genus Pamphila. By Samuel H. Scudder. pp. 13. Two Plates (one colored). \$1.00.

Antiquity of Caverns and Cavern Life of the Ohio Valley. By Prof. N. S. Shaler. pp. 9. One Plate. 40 cents.

PART IV.

Monograph of the Tabanidae, Pt. I. By C. R. Osten Sacken. pp. 33. 65 cents.

Revision of North American Porifera, Pt. I. By A. Hyatt. pp. 10. One Plate. 75 cents.

Gynandromorphism in Lepidoptera. By A. S. Packard, Jr., M.D. Structure and Transformations of Eumæus Atala. By S. H. Scudder. pp. 11. One Plate. 75 cents.

Monograph of the Tabanidae, Pt. II. By C. R. Osten Sacken. pp. 59. \$1.00.

THE ENTOMOLOGICAL CORRESPONDENCE OF DR. T. W. HARRIS.

EDITED BY S. H. SCUDDER.

8vo. Portrait and 4 plates. 1869. Cloth. To members, \$4.50; to the public \$5.00.

CENTENNIAL ANNIVERSARY OF THE BIRTH OF ALEXANDER VON HUMBOLDT.

Address delivered by Louis Agassiz. With an account of the evening reception.

pp. 138. 1869. 50 cents.

THE SPIDERS OF THE UNITED STATES.

BY N. M. HENTZ, M.D.

EDITED BY EDWARD BURGESS, WITH NOTES BY JAMES H. EMERTON.

8vo. 21 Plates. 1875. Cloth, \$3.50; Paper, \$3.00.

Supplement cont.

(see ante, p. 432).

6. Tabanus fuscopunctatus (see ante, p. 432).
Male: Colored as ♀, ^{very} small white abdominal spots; tooth-like projec. on 3rd ant. joint very large. Head larger than ♀, without being very large for a male Tabanus. Line of div. bet large & small facets very distinct. 20 mm. Ga. (H K Morrison).

7. Tabanus longus (see ante p. 447).

Additions to desc. Female. In second line strike out the words "connected with it". Third ant. joint usually red, annulate portion black, occas. darker. Scut. sometimes reddish. Abdom. grayish brown rather than grayish black. The median abdominal line seems to be visible only in very well preserved spms; ordinarily, it appears as a line, interrupted at incisures rather than as a series of triangles.

8. Tabanus rufus see ante p. 456 Male: much darker than ♀. Head not proportionately large than ♀; very little apparent diff. in size of facets. Thorax black, with some yellowish pile, especially on pleurae. Abdom. black in middle, dark reddish brown on sides, a fringe of black pile along lateral margins. Wings ± brownish, a cloud on bifur. of 3rd vein; 1st post cell. distinctly coarctate. Legs yellow with black pile; front femora darker. 19 mm. 2 spms. Ga. H K Morrison

2. 17
by abundant f.

2. 17
by abundant f.

2. 17
by abundant f.

SMITHSONIAN INSTITUTION LIBRARIES

3 9088 00250237 5

nhent: QL537 T25085

Prodrome of a monograph of the Tabanidae